135-TRC-09-003

SAFETY COMPLIANCE TESTING FOR FMVSS 135
Passenger Car Brake Systems

Hyundai Motor Company
2009 Hyundai Azera GLS, 4-Door Sedan
NHTSA No. C90507

TRANSPORTATION RESEARCH CENTER INC.
10820 State Route 347
East Liberty, Ohio 43319

Final Report Completed: March 17, 2009

FINAL REPORT

Prepared Under Contract No.: DTNH22-06-C-00033

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
1200 New Jersey Avenue S.E.
West Building 4th Floor
OVSC (NVS-221)
Washington, DC 20590

Prepared for the Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-06-C-00033.

Prepared By _____

Approved By _____

Approval Date: 3/19/09

Final Report Acceptance By OVSC:

_____

Contract Technical Manager, Office of Vehicle Safety Compliance

3/24/09

Acceptance Date

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4. TITLE AND SUBTITLE: Final report of FMVSS 135 Compliance Testing of a 2009 Hyundai Azera GLS, 4-Door Sedan, NHTSA No. C90507		5. REPORT DATE: March 17, 2009 6. PERFORMING ORGANIZATION CODE: TRC 20060110/9354
7. AUTHOR(S): Project Manager: ALAN IDA Project Engineer: RANDALL A. LANDES		8. PERFORMING ORGANIZATION REPORT NO.: TRC-DOT-135-087
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Transportation Research Center Inc. 10820 State Route 347 East Liberty, Ohio 43319		10. WORK UNIT NUMBER: 11. CONTRACT OR GRANT NO.: DTNH22-06-C-00033
12. SPONSORING AGENCY NAME AND ADDRESS: U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance (NVS-221) 1200 New Jersey Avenue S.E. West Wing 4th Floor Washington, DC 20590		13. TYPE OF REPORT AND PERIOD COVERED: Final test report Tested: 02/19/09 to 03/13/09 14. SPONSORING AGENCY CODE: NVS-221
15. SUPPLEMENTARY NOTES:		
16. ABSTRACT: Compliance tests were conducted on the subject 2009 Hyundai Azera GLS, 4-Door Sedan, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-135-01 for the determination of FMVSS 135 compliance. Test failures identified were as follows: None.		
17. KEY WORDS: Compliance Testing Safety Engineering FMVSS 135		18. DISTRIBUTION STATEMENT: Copies of this report are available from: NHTSA Technical Information Services NPO-411 1200 New Jersey Ave, S.E. Washington, DC 20590 Email: tis@nhtsa.dot.gov FAX: 202-493-2833
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1.0 INTRODUCTION

Tests were conducted on a 2009 Hyundai Azera GLS, 4-Door Sedan, manufactured in Korea by Hyundai Motor Company, to determine compliance with FMVSS 135 "Passenger Car Brake Systems." All tests were conducted in accordance with the U.S. D.O.T., NHTSA Laboratory Procedure TP 135-01 and/or the corresponding TRC Inc. Test Procedure that was submitted to NHTSA for their approval. The Test Procedure was clearly described in the submitted document and has not been repeated in this report.

All stops were performed manually.

All tests were conducted by TRC Inc. personnel using the following TRC facilities:

7.5-Mile Test Track
Vehicle Maximum Speed
Burnish
Heating Snubs and Hot Performance Stops
Brake Cooling and Recovery Stops

Skid Pad
Cold Effectiveness Stops
High Speed Effectiveness Stops
Stops with Engine Off
Failed ABS
Failed Variable Proportioning Valve (if applicable)
Failed Hydraulic Circuits
Brake Power Assist Unit Failures
RBS Failure (if applicable)
EMF (Battery) Failure (if applicable)

Brake Slope
Parking Brake

Average PFC during the test period was 0.93 (Skid Pad) and 0.90 (Test Track) utilizing the ASTM E1337 w/E1336 tire method.

The test vehicle was ABS equipped. Therefore, the Wheel Lock Sequence and Adhesion Utilization Tests were not performed.

This vehicle met the requirements of FMVSS 135.

DATA SHEET 1 - VEHICLE INFORMATION

VEHICLE SPECS

Year:	2009	NHTSA No:	C90507
Mfr:	HYUNDAI MOTOR COMPANY	GVWR (Kg):	2150
Make:	HYUNDAI	GAWR Front(Kg):	1260
Model:	AZERA GLS	GAWR Rear(Kg):	1115
Body Style:	4 DOOR SEDAN	Wheelbase (mm):	2781.3
Mfr. Date:	March 31 2008	Odometer: Start:	127 MI. End: 658 MI.
VIN:	KMHFC46D49A349877		

BUSES ONLY

Chassis Mfg.:	N/A
Serial No.:	N/A
No. of Seats:	N/A
Manufacture Date:	N/A

Engine Type:	GASOLINE,MPI-DOHC, V6,PISTON		
Displacement:	3.3 LITER	Tire Size:	P235/55R17
Engine Hspwr:	N/A	Tire Type:	ENERGY, MXV4 PLUS, XSE,TUBELES
Idle Speed(rpm):	678	Tire Mfr.:	MICHELIN
Transmission Type:	AUTO.5-SPD., FWD	GVWR Front Press.(kpa):	210
No. of Axles:	2	GVWR Rear Press.(kpa):	210

BRAKE APPLY SYSTEM

Brake Series:	Front:DISC Rear:DISC	Power Assist Unit:	YES
Brake Actuation (Hydr. Circuit Split):	DIAGONAL	Pwr Unit w/Accumulator:	NO
		Pwr Asst./Pwr Unit w/Backup:	NO
Power Unit:	VACUUM	Variable Prop. System:	YES
Anti-Skid unit Mfr:	BOSCH	Anti-Skid Device:	YES
Parking Mechanism:	YES		
Type of Parking Unit:	AUTOMATIC TRANSMISSION W/PARK DETENT		
Mstr Cylinder Dia(mm):	Not Available	Pedal Ratio:	4.0 : 1

FRONT SYSTEM BRAKE COMPONENT MATERIALS AND CONSTRUCTION:

BRAKE TYPE:	DISC	Material:	CAST
Drum Construction:	N/A	LF Drum Shoe Cage Dia.(mm):	0.00
Disc Construction:	CAST,VENTED	RF Drum Shoe Cage Dia.(mm):	0.00
Front Brake Dia.(mm):	303.00	LF Drum Dia. RESET(mm):	0.00
Fr Disc Thickness(mm):	28.04	RF Drum Dia. RESET(mm):	0.00
Lining Construction:	Bonded		

FRONT BRAKE COMPONENT DIMENSIONS AND CODES:

	Inboard (Leading)	Outboard (Trailing)
Width(mm):	54.05	54.18
Length(mm):	116.46	116.46
Thickness(mm):	10.64	10.62
Lining Code/Color:	SAC PD38GH FF	SAC PD38GH FF
Hyd. Piston Dia.(mm):	59.94	

PLOTS\INTRODGS\SETUP + SETUP2

DATA SHEET 1 - (CONTINUED)

REAR SYSTEM BRAKE COMPONENT MATERIALS AND CONSTRUCTION:

BRAKE TYPE: DISC
Drum Construction: N/A
Disc Construction: CAST,UNVENTED
Lining Construction: BONDED
Rear Brake Dia.(mm): 283.95
Rr Disc Thickness(mm): 9.96
Lining Construction:Bonded

Material: CAST
LR Drum Shoe Cage Dia.(mm): 0.00
RR Drum Shoe Cage Dia.(mm): 0.00
LR Drum Dia. RESET(mm): 0.00
RR Drum Dia. RESET(mm): 0.00

REAR BRAKE COMPONENT DIMENSIONS AND CODES:

Inboard (Leading)
Width(mm): 34.52
Length(mm): 81.13
Thickness(mm): 9.83
Lining Code/Color: SAC PD54A FF
Hyd Piston Dia (mm): 35.05

Outboard (Trailing)
Width (mm): 34.42
Length (mm): 81.23
Thickness (mm): 9.55
Lining Code/Color: SAC PD54A FF

OTHER COMPONENT INFORMATION:

Friction-type Park Brake: N/A
Non-Service Brake Type
Parking Brake: FOOT-OPERATED

NOTE: If at any time after the test series has begun, any brake system part requires replacement or the brake system requires adjustments other than permitted in burnish and reburnish procedures, discontinue testing and notify the COTR immediately.

Technician: Jerry Inman JERRY INMAN Date: 3/20/09

Quality Assurance: Randy Landes RANDY LANDES

VEHICLE: 2009 Hyundai Azera GLS NHTSA NO.: C90507 DATE: 03/13/09

3.0 SUMMARY OF TESTING

		Specification and Limit				TEST RESULTS (In compliance if one stop meets requirement)			
TEST	Loading Condition	Speed (km/h)	Min. Pedal Force (N)	Max. Pedal Force (N)	Stopping Distance Requirement (m)	Shortest Stop Min. Pedal Force (N)***	Shortest Stop Max. Pedal Force Newtons (Average – N)	Shortest Stop Stopping Distance (m) (Corrected)	PASS Fail
Equipment Requirements					Specified Equipment	Vehicle contains specified equipment			Pass
Vehicle Maximum Speed	LLVW	NA				224.5 km/h avg.			NA
Burnish	GVWR	80				200, 80 - 0 km/h stops @ 3.0 mpsps			NA
Wheel Lockup Sequence w/o ABS	GVWR				Lockup of front wheels prior to rear	ABS equipped – not required.			NA
Wheel Lockup Sequence w/o ABS	LLVW					ABS equipped – not required.			NA
Adhesion Utilization w/o ABS	LLVW				Rear axle adhesion utilization curve below specified value	ABS equipped – not required.			NA
Adhesion Utilization w/o ABS	GVWR					ABS equipped – not required.			NA
Cold Effectiveness	GVWR	100	65	500	70	5	491.4	56.6	Pass
High Speed Effectiveness	GVWR	160.0	65	500	spd. depend. – 187.5	5	453.1	121.8	Pass
Stops with Engine Off	GVWR	100	65	500	70	5	430.0	51.4	Pass
Cold Effectiveness	LLVW	100	65	500	70	5	475.3	45.9	Pass
High Speed Effectiveness	LLVW	160.0	65	500	spd. depend. – 187.5	5	368.2	110.1	Pass
Failed Antilock	LLVW	100	65	500	85	5	280.5	56.0	Pass
Failed Proportioning Valve	LLVW	100	65	500	110	5	51.6	196.3	Pass
Failed Hydraulic Circuit #1	LLVW	100	65	500	168	5	477.9	89.0	Pass
Failed Hydraulic Circuit #2	LLVW	100	65	500	168	5	469.6	87.8	Pass
Failed Hydraulic Circuit #1	GVWR	100	65	500	168	5	467.4	103.1	Pass
Failed Hydraulic Circuit #2	GVWR	100	65	500	168	5	461.0	96.5	Pass
Failed Antilock	GVWR	100	65	500	85	5	343.2	59.5	Pass
Failed Proportioning Valve	GVWR	100	65	500	110	5	386.7	53.9	Pass
Regenerative Brake System (RBS) Failure	GVWR	100	65	500	168	5	NA	NA	NA
Electromotive Force (EMF) – Battery Failure	GVWR	100	65	500	70	5	NA	NA	NA
Power Brake Unit Failure	GVWR	100	65	500	168	5	496.3	135.5	Pass
Parking Brake - Uphill	GVWR	-	-	500	Hold for 5 min.?	NA	488.6	Yes-Holds	Pass
Parking Brake - Downhill	GVWR	-	-	500	Hold for 5 min.?	NA	483.7	Yes-Holds	Pass
Heating Snubs	GVWR	120-60	NA	NA	15 Snubs- 3.0 mpsps	5	47 Vis. Avg.	NA	NA
Hot Performance Stop #1	GVWR	100	65	350	89.1	5	181.4 (110.1)	93.3	*
Hot Performance Stop #2	GVWR	100	65	500	89	5	424.5 (311.8)	64.4	Pass
Brake Cooling	GVWR	50	NA	NA	4 Stops - 3.0 mpsps	5	47 Vis. Avg.	NA	NA
Recovery Performance Stop #1	GVWR	100	65	350	One of the two stops between 77.8 and 41.7 meters.	5	340.8 (214.6)	52.5	Pass
Recovery Performance Stop #2	GVWR	100	65	350		5	374.1 (149.2)	49.1	
Final Inspection-Brake Integrity	Check components for detachment, fracture or lubricants.					No detachments or fractures-normal appear. & colr.			Pass
Final Inspection-Reservoirs/Warning Indicators	Master cylinder or brake power reservoir shall meet the volume and label requirements of S5.4.2 and S5.4.3.					Brake system has sufficient capacity and indicators are in compliance.			Pass

*** Note: The Shortest Stop Minimum Pedal Force represents the minimum force value required to engage the data acquisition's recording mode.
* Conditional PASS, see Appendix C – Contractor's Comments.

DATA SHEET 3 - VEHICLE WEIGHT

VEHICLE: 2009 HYUNDAI AZERA GLS NHTSA No. C90507 Date: 02/23/09

Tire Pressure(cold): Front (kpa) 210 Rear (kpa) 210
Odometer: Start 127 MI. End 658 MI.
Scale(s) Used: TRC Scales

NOTE: GVWR, LLVW and axle weights to be measured within +0% and -1%.

GVWR/GAWR INFORMATION
(From Veh. Certification Label)

GVWR(Kg): 2150
GAWR Front(Kg): 1260
GAWR Rear(Kg): 1115

UNLOADED VEHICLE WEIGHT(UVW)

L Front(Kg): 523 L Rear(Kg): 328
R Front(Kg): 517 R Rear(Kg): 308
T Front(Kg): 1040 T Rear(Kg): 636
Total UVW(Kg): 1676

TARGET LIGHT LOADED WEIGHT(LLVW):

NOTE 1: LLVW = UVW+181.4Kg
NOTE 2: Weight distributed in front passenger seat area.
NOTE 3: Neither axle load at LLVW less than at UVW; ballast as required.

L Front(Kg): 572 L Rear(Kg): 371
R Front(Kg): 564 R Rear(Kg): 349
T Front(Kg): 1136 T Rear(Kg): 720
Total LLVW(Kg): 1857

ACTUAL LIGHT LOADED WEIGHT(LLVW):

L Front(Kg): 574 L Rear(Kg): 373
R Front(Kg): 562 R Rear(Kg): 348
T Front(Kg): 1136 T Rear(Kg): 721
Total Actual Test LLVW(Kg): 1857

Load: Driver/Observer 91(Kg) + Instru.41(Kg) + Ballast 49(Kg) = 181(Kg)

FULLY LOADED TEST WEIGHT (ACTUAL GVWR)

NOTE 1: Vehicle loaded so axle loads proportional to GAWR shown previously.
NOTE 2: But no axle weight to be less than at LLVW.
NOTE 3: If weight on any axle at LLVW exceeds the axle's proportional share of the GVWR, the load required to reach GVWR is placed so that the weight on that axle remains the same as at LLVW.

L Front(Kg): 570 L Rear(Kg): 514
R Front(Kg): 570 R Rear(Kg): 496
T Front(Kg): 1140 T Rear(Kg): 1010
Total Fully Loaded GVWR(Kg): 2150

Load: Driver/Observer 91(Kg) + Instru. 41(Kg) + Ballast 342(Kg)= 474(kg)

Technician: Jerry Inman JERRY INMAN Date: 3/20/09

Quality Assurance: Randy Landes RANDY LANDES

DATA SHEET 4 - EQUIPMENT REQUIREMENTS (S5)

SERVICE BRAKE SYSTEM (S5.1)

Vehicle equipped with a service brake system acting on all wheels? YES

Wear Adjustment (S5.1.1):
Service Brakes are compensated for wear by means of a system of automatic adjustment? YES
Describe: DISC:AUTOMATIC CLEARANCE TAKE-UP.

Wear Status (S5.1.2):
Wear status of service brakes is indicated by:
(A) Acoustic or optical device? YES
Describe: METAL TAB EMITS HIGH FREQUENCY SQUEAL WHEN WORN.
(B) Visual check outside or under vehicle? YES
Describe: FRONT AND REAR:LOOK THROUGH CALIPER.

PARKING BRAKE SYSTEM (S5.2)

Vehicle equipped with a parking brake system of a friction type with solely mechanical means to retain engagement: YES

CONTROLS (S5.3)

(A) Service brakes activated by means of a foot control? YES
(B) Parking brake control is independent of the service brake control? YES
(C) Parking brake control is hand or foot operated? YES
(D) ABS, if equipped, cannot be manually disabled? YES

DATA INDICATES COMPLIANCE: YES

COMMENTS: NONE.

Tester/Technician: Jerry Inman JERRY INMAN Date: 3/20/09

Quality Assurance: Randy Landes RANDY LANDES

DATA SHEET 5 - VEHICLE MAX SPEED

VEHICLE: 2009 HYUNDAI AZERA GLS NHTSA No. C90507 Date: 02/23/09

Ambient Temperature: 29°F Wind Velocity: 6(MPH)
Road PFC: 0.91 Wind Direction: 216°
Odometer: Start 158(mi) End 173(mi)

TEST WEIGHT: Total (Kg): 1857 Front (Kg): 1136 Rear (Kg): 721

ESTABLISH VEHICLE MAXIMUM SPEED

VEHICLE LOAD: LLVW IBT: N/A
GEAR: Drive DECEL RATE: N/A
PEDAL FORCE: N/A WHEEL LOCKUP: N/A
TEST SPEED: Maximum attainable from a standing start in 3.2 km. INTERVAL: N/A

1. Ballast Vehicle to LLVW
2. Accelerate at a maximum rate from a standing start for a distance of 3.2 km on a level surface.
3. Repeat in opposite direction.
4. Record speed attained in each direction and use the average of the two runs.

	DIRECTION	MAX SPEED (km/h)		Time 0 - 100 KPH (seconds)
		Visual	Recorded	
Run No. 1	South	221	221.1	10.09
Run No. 2	North	227	227.9	9.96

AVERAGE = 224.5 km/h

COMMENTS: INV DATA, Section 0001, 02/24/09, 11:35:42

Tester/Technician: Jerry Inman JERRY INMAN Date: 3/20/09

Quality Assurance: Randy Landes RANDY LANDES

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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(937)666-2011 www.trcpg.com

Date Tested: 02/24/09

DATA SHEET 6 - BURNISH AT GVWR

Testing Conditions: INV DATA, Section 0002, 02/24/09, 14:11:53

Weather Conditions: 54°F Wind:15 mph 220°

Start Odo.: 180 End Odo.: 455

Schedule:
Initial Brake Temperature Less Than 100°C
Initial Speed 80 km/h to zero
200 stops with transmission in gear

Performance Requirements:
Interval between runs: Time necessary to reduce IBT to 100 C° or 2 km distance, whichever occurs first.
Constant decel rate: 3.0 m/s^2
Pedal force adjusted to maintain constant decel.
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	AVG. DECEL (m/sec^2)
1	80.16	32	34	21	23	69.80	55.80	2.77
10	80.94	88	99	94	97	53.19	41.85	3.20
20	81.34	85	97	102	102	48.99	42.13	3.27
30	80.53	91	99	102	102	75.99	57.90	2.93
40	80.96	100	101	91	94	78.13	64.24	2.77
50	80.63	95	96	95	102	83.68	65.04	2.85
60	79.94	95	97	94	101	88.78	62.26	2.84
70	79.52	101	101	99	106	76.48	60.62	2.97
80	80.77	98	97	96	102	83.68	66.45	2.92
90	79.93	96	101	97	102	76.60	67.30	3.12
100	80.45	99	101	98	102	72.12	64.19	2.95
110	80.83	104	104	102	106	87.59	63.40	2.91
120	80.52	92	95	83	83	78.41	65.83	3.03
130	80.44	100	110	102	107	75.01	60.56	3.23
140	81.28	109	114	109	115	72.69	61.13	2.96
150	79.51	102	114	109	116	82.15	60.85	2.92
160	80.69	101	119	112	117	76.26	65.55	3.03
170	80.73	105	118	109	115	68.38	55.86	2.93
180	80.80	98	118	108	112	78.46	59.15	3.20
190	80.13	96	120	111	112	76.20	56.09	3.00
200	79.64	101	118	111	113	78.97	58.13	2.97

COMMENTS: THIS VEHICLE ABS EQUIPPED. DATA SHEETS 7-10 NOT INCLUDED.

BRAKE ADJUSTMENT

Schedule:
Adjust service brakes; record procedure and amount adjusted.

Left Front: DISC NONE
Right Front: DISC NONE
Left Rear: DISC NONE
Right Rear: DISC NONE
DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 02/26/09

DATA SHEET 11 - COLD EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0015, 02/26/09, 10:49:36

Weather Conditions: 48°F Wind: 8 mph 183° Start Odo.: 462 End Odo.: 475

Schedule:
Initial Brake Temperature 65 - 100 C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.18	68	75	62	55	68.3	68.1	278.09	191.78	8.47	5.65
2	99.74	70	74	49	40	64.7	65.1	414.41	295.44	8.48	5.98
3	99.26	78	81	51	41	67.6	68.6	371.14	290.11	9.32	6.00
4	100.18	82	83	48	38	50.5	50.3	368.93	120.78	13.45	7.64
5	99.47	67	71	52	48	62.2	62.9	439.92	334.11	10.20	6.32
6	100.79	87	88	57	51	57.5	56.6	491.36	349.82	11.01	6.66

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	RFX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 02/26/09

DATA SHEET 12 - HIGH SPEED EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0020, 02/26/09, 14:01:16

Weather Conditions: 49°F Wind: 7 mph 221° Start Odo: 479 End Odo: 489

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h, not greater than 160km/h
6 stops with transmission in gear
Target Initial Speed: 160.00 kph

Performance Requirements:
One Stop with:
Stopping Distance less than: **187.5 meter**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	159.89	69	66	51	44	132.7	132.9	396.20	315.26	12.15	7.55
2	154.50	92	89	64	56	126.8	135.9	272.54	218.97	11.92	7.58
3	159.13	93	95	55	51	122.3	123.6	513.55	336.90	13.48	8.13
4	159.51	83	96	42	52	122.2	123.0	486.12	345.47	15.11	8.49
5	160.06	85	93	43	46	121.9	121.8	453.12	356.49	12.78	8.39
6	158.95	89	97	49	46	131.7	133.5	478.05	129.17	13.30	2.90

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/02/09

DATA SHEET 13 - STOPS WITH ENGINE OFF AT GVWR

Testing Conditions: INV DATA, Section 0025, 03/02/09, 08:31:25

Weather Conditions: 13°F Wind: 14 mph 34° Start Odo.: 495 End Odo.: 507

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.07	73	76	42	49	51.5	51.4	429.96	204.00	15.08	7.88
2	99.11	71	81	35	39	61.2	62.3	493.83	372.89	9.63	6.94
3	100.41	84	95	37	42	60.9	60.4	504.78	396.66	10.17	6.72
4	101.51	89	96	39	42	52.8	51.3	502.34	272.87	13.49	7.97
5	100.75	89	99	38	44	62.4	61.4	527.25	390.81	9.80	7.08
6	100.25	88	100	30	34	60.7	60.4	457.47	382.13	9.83	6.96

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/02/09

DATA SHEET 14 - COLD EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0030, 03/02/09, 10:06:51

Weather Conditions: 15°F Wind: 7 mph 63° Start Odo.: 512 End Odo.: 517

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.37	68	72	31	39	47.5	48.1	494.35	256.08	14.26	6.51
2	100.43	83	88	30	34	47.0	46.6	429.22	249.21	14.44	7.92
3	101.23	81	87	24	26	47.9	46.7	456.56	229.93	13.67	6.12
4	100.03	89	96	28	27	46.7	46.6	462.18	311.56	13.59	8.50
5	99.37	84	94	25	23	48.9	49.5	476.65	360.35	12.78	8.80
6	99.80	87	97	22	21	45.7	45.9	475.28	307.70	14.60	8.51

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/02/09

DATA SHEET 15 - HIGH SPEED EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0035, 03/02/09, 10:35:19

Weather Conditions: 16°F Wind: 10 mph 53° Start Odo.: 518 End Odo.: 526

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than 187.5m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	158.92	72	78	17	17	116.1	117.7	450.44	218.86	16.30	5.88
2	159.06	88	97	21	21	108.3	109.6	508.41	323.47	15.20	9.70
3	159.61	85	97	16	17	112.3	112.8	480.05	296.98	15.05	8.01
4	159.03	83	97	17	16	110.8	112.1	413.51	326.42	14.95	9.91
5	159.76	84	100	14	13	111.7	112.1	449.53	216.20	16.68	6.89
6	160.52	81	99	14	12	110.8	110.1	368.18	289.66	15.18	9.21

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/03/09

DATA SHEET 16 - ANTILOCK FUNCTIONAL FAILURE AT LLVW

Testing Conditions: INV DATA, Section 0045, 03/03/09, 08:28:19

Weather Conditions: 14°F Wind: 3 mph 50° Start Odo.: 543 End Odo.: 549

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.84	70	75	40	41	57.1	56.2	319.67	199.80	9.71	7.13
2	100.17	72	78	27	29	56.4	56.2	244.05	192.54	9.26	6.98
3	99.57	87	96	29	32	57.2	57.7	253.36	196.97	9.41	6.66
4	100.19	90	98	24	27	56.2	56.0	280.47	178.76	10.04	6.51
5	100.89	88	98	22	25	57.2	56.2	227.66	177.45	9.96	6.82
6	99.86	89	99	22	27	56.3	56.5	207.63	174.61	10.28	6.82

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: DISCONNECT RIGHT FRONT WHEEL SPEED SENSOR

Is brake system indicator lamp activated: YES (X) NO ( )

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/02/09

DATA SHEET 17 - VARIABLE BRAKE PROP. FUNCTION FAILURE AT LLVW

Testing Conditions: INV DATA, Section 0040, 03/02/09, 12:36:13

Weather Conditions: 19°F Wind: 16 mph 32° Start Odo.: 528 End Odo.: 534

Schedule:
Intial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **110m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.30	67	76	28	34	51.9	51.6	196.29	152.43	11.47	7.49
2	100.72	76	76	33	27	56.8	56.0	228.45	71.59	11.35	3.76
3	99.52	69	77	24	26	55.4	56.0	231.52	131.78	10.84	6.71
4	100.52	72	83	28	27	53.0	52.5	210.07	156.18	11.09	7.14
5	100.09	79	90	31	28	53.3	53.2	177.39	143.24	11.36	7.11
6	100.69	78	90	31	27	53.5	52.7	305.32	138.70	10.56	7.18

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	LRX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/03/09

DATA SHEET 18 - HYDRAULIC CIRCUIT FAILURE #1 AT LLVW

Testing Conditions: INV DATA, Section 0050, 03/03/09, 10:04:39

Weather Conditions: 18°F Wind: 3 mph 63° Start Odo.: 552 End Odo.: 555

Method of simulating failure: Disconnected Brake Line @ M/C Front Port

System Portion Failed: RF & LR

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
4 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.89	72	22	6	43	95.1	95.3	478.06	399.21	6.09	4.16
2	101.17	95	17	2	37	94.6	92.4	453.16	392.91	6.54	4.59
3	101.39	97	12	-1	31	91.5	89.0	477.89	419.23	6.79	4.32
4	99.38	99	11	-2	31	90.5	91.7	477.84	430.75	6.55	4.38

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES

Force Needed to Activate Brake Failure Lamp (N): N/A
Fluid Removed (mL) to Activate Brake Failure Lamp: 265

Is brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/03/09

DATA SHEET 19 - HYDRAULIC CIRCUIT FAILURE #2 AT LLVW

Testing Conditions: INV DATA, Section 0055, 03/03/09, 11:04:21

Weather Conditions: 19°F Wind: 0 mph 334° Start Odo.: 558 End Odo.: 562

Method of simulating failure: Disconnected Brake Line @ M/C Rear Port

System Portion Failed: LF & RR

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
4 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.90	36	82	52	9	93.2	93.4	452.14	367.10	6.66	4.12
2	100.95	27	98	49	6	89.2	87.5	469.55	295.11	7.97	4.50
3	100.35	21	98	51	3	90.4	89.8	447.66	311.84	8.61	5.01
4	100.16	17	100	58	2	87.7	87.4	423.72	303.39	7.25	5.06

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES

Force Needed to Activate Brake Failure Lamp (N): N/A
Fluid Removed (mL) to Activate Brake Failure Lamp: 265

Is brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/03/09

DATA SHEET 20 - HYDRAULIC CIRCUIT FAILURE #1 AT GVWR

Testing Conditions: INV DATA, Section 0060, 03/03/09, 13:27:51

Weather Conditions: 25°F Wind: 7 mph 348° Start Odo.: 574 End Odo.: 577

Method of simulating failure: Disconnected Brake Line @ M/C Front Port

System Portion Failed: RF & LR

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.66	78	44	23	64	106.3	107.0	416.63	354.17	5.04	3.73
2	99.68	98	32	17	49	107.1	107.8	465.92	377.08	5.41	3.69
3	100.25	97	24	13	39	106.5	105.9	431.89	371.07	5.55	4.07
4	101.39	96	22	11	38	106.0	103.1	467.40	398.19	5.85	3.67

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES

Is brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/03/09

DATA SHEET 21 - HYDRAULIC CIRCUIT FAILURE #2 AT GVWR

Testing Conditions: INV DATA, Section 0065, 03/03/09, 12:20:17

Weather Conditions: 23°F Wind: 3 mph 154° Start Odo.: 567 End Odo.: 570

Method of simulating failure: Disconnected Brake Line @ M/C Rear Port

System Portion Failed: LF & RR

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
4 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.27	14	79	47	8	112.0	111.4	461.50	410.61	6.14	3.70
2	100.53	13	98	54	6	97.6	96.5	461.04	328.64	6.93	4.61
3	99.63	11	97	56	5	100.2	101.0	349.46	282.57	6.68	4.87
4	99.88	9	96	41	5	100.6	100.8	334.54	280.02	5.34	3.81

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	- NOX	SOUTH	YES
2	- NOX	SOUTH	YES
3	- NOX	SOUTH	YES
4	- NOX	SOUTH	YES

Is brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/04/09

DATA SHEET 22 - ANTILOCK FUNCTIONAL FAILURE AT GVWR

Testing Conditions: INV DATA, Section 0070, 03/04/09, 08:49:15

Weather Conditions: 23°F Wind: 5 mph 201° Start Odo.: 590 End Odo.: 596

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.23	69	76	52	47	61.1	60.8	278.27	220.97	8.72	6.46
2	99.94	86	91	51	44	61.7	61.7	284.50	180.45	9.05	6.24
3	99.08	91	96	49	42	61.6	62.7	213.43	172.85	11.11	6.24
4	99.86	92	97	49	41	61.2	61.4	270.16	197.90	9.22	6.33
5	100.51	92	97	46	38	61.3	60.7	279.06	220.69	9.23	6.48
6	99.46	93	98	44	36	58.9	59.5	343.21	282.46	9.32	6.74

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: DISCONNECT RIGHT FRONT WHEEL SPEED SENSOR

Is brake system indicator lamp activated: YES (X) NO ( )

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/04/09

DATA SHEET 23 - VARIABLE BRAKE PROP. FUNCTION FAILURE AT GVWR

Testing Conditions: INV DATA, Section 0075, 03/04/09, 10:13:35

Weather Conditions: 30°F Wind: 9 mph 183° Start Odo.: 598 End Odo.: 604

Schedule:
Intial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **110 m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.90	69	74	51	44	57.5	57.6	316.35	253.61	9.94	6.97
2	99.86	83	88	55	47	55.7	55.9	315.67	254.58	10.05	7.05
3	100.21	92	97	59	51	55.2	55.0	386.63	220.97	10.03	6.92
4	99.64	91	94	57	47	55.7	56.1	305.75	227.15	9.85	6.71
5	100.23	93	97	58	49	55.1	54.8	370.25	290.68	10.39	7.14
6	100.31	91	94	57	47	54.2	53.9	386.74	317.20	10.59	7.13

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/04/09

DATA SHEET 24 - BRAKE POWER UNIT OR PWR ASSIST UNIT IN/OP AT GVWR

Testing Conditions: INV DATA, Section 0080, 03/04/09, 11:06:11

Weather Conditions: 33°F Wind: 6 mph 171° Start Odo.: 607 End Odo.: 614

Failure Simulation: Disconnect primary source of power.

Method of rendering inoperative: Removed Engine Vacuum Hose at Booster

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec^2)	AVG. DECEL (m/sec^2)
1	100.39	84	89	56	47	152.8	151.6	477.08	451.12	4.28	2.66
2	100.60	79	87	44	42	151.5	149.7	490.11	469.03	4.09	2.91
3	100.53	75	81	45	38	144.3	142.8	498.05	474.92	4.22	2.72
4	100.58	84	91	54	46	141.5	139.9	507.51	473.22	3.82	2.84
5	101.08	91	95	56	50	138.5	135.5	496.29	475.43	4.09	2.84
6	99.62	91	94	57	51	139.5	140.6	501.50	475.83	4.43	2.74

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Is the brake system indicator lamp activated: YES ( ) NO (X)

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/04/09

DATA SHEET 25 - PARKING BRAKE AT GVWR

Testing Conditions: INV DATA, Section 0085, 03/04/09, 12:59:09
Parking brake: AUTOMATIC TR Non-service type: FOOT-OPERATED Service type: N/A

Weather Conditions: 37°F Wind: 4 mph 157° Start Odo.: 616 End Odo.: 617

Test Weight: Total:2150kg Front:1140kg Rear:1010kg

Schedule:
Initial Brake Temperature <100°C or (Ambient temp. if non-service brake type materials)
Loaded to GVWR with transmission in neutral
Drive onto 20% slope in forward and reverse directions.

Performance Requirements:
Up to Three Applies in each direction:
Parking brake must hold the vehicle stationary in both directions for 5 minutes each.
Pedal force: Hand control: <400 N
Foot control: <500 N

NOTE: For vehicles with parking brake systems not utilizing the service brake friction elements, the friction elements of such systems are to be burnished prior to parking brake tests according to the manufacturer's published recommendation as furnished to the purchaser. If no recommendations are furnished, test the system in an unburnished condition. If recommendations are furnished, record method used.

APPLY #	MAX SERVICE FORCE (N)	MAX P-BRAKE FORCE (N)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	AVG REAR IBT (°C)	DRIVER VEHICLE STOP COMMENTS (Direction of Stop (Up/Down) - Brake holds/fails)
1	65.2	488.6	29	31	30.0	- 0 REAPPLY UPHILL HOLDS 20%
2	59.8	483.7	16	22	18.9	- 0 REAPPLY DOWNHILL HOLDS 20%

Is brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/05/09

DATA SHEET 26 - HEATING SNUBS AT GVWR

Testing Conditions: INV DATA, Section 0090, 03/05/09, 07:24:02

Schedule:
Conduct 15 snubs from 120 Km/h or 80% Vmax, whichever is slower, to 1/2 of initial speed.
Attain required decel in 1 second and maintain that decel.
Interval between snubs is 45 seconds and WOT to initial speed.

Performance Requirements:
Initial IBT for first snub is 55-65°C
Maintain 3.0 m/s/s deceleration
Vehicle Must stay in lane of 3.5m

SNUB #	AVG. DECEL (m/sec^2)	Time Between Snubs (second)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	INIT SPD (kph)
1	3.75	--NA--	48.20	64	62	47	42	120.56
2	3.30	40	43.09	108	109	74	69	120.23
3	3.61	45	45.76	142	150	103	95	120.06
4	3.25	45	40.09	168	182	131	120	120.53
5	3.12	45	37.37	189	205	152	141	120.23
6	3.14	45	38.33	207	224	171	159	121.34
7	3.22	45	49.10	221	239	188	176	120.79
8	2.98	45	50.12	236	254	204	192	120.99
9	3.13	45	45.99	248	266	216	204	120.62
10	3.11	45	44.45	259	276	225	216	120.30
11	3.11	45	48.31	266	284	232	222	120.21
12	3.12	45	57.72	271	288	237	228	120.80
13	3.15	45	53.92	275	291	242	234	120.92
14	3.23	45	53.53	279	294	247	239	120.83
15	3.27	45	46.89	282	298	251	244	120.46

STOP #	DRIVER VEHICLE SNUB COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	EAST	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	WEST	YES
6	-	NOX	WEST	YES
7	-	NOX	NORTH	YES
8	-	NOX	NORTH	YES
9	-	NOX	NORTH	YES
10	-	NOX	EAST	YES
11	-	NOX	SOUTH	YES
12	-	NOX	SOUTH	YES
13	-	NOX	SOUTH	YES
14	-	NOX	WEST	YES
15	-	NOX	NORTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/05/09

DATA SHEET 27 - HOT PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0095, 03/05/09, 07:34:57

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is: 6
Initial speed of stop: 100.79 (kph)
Actual distance of stop: 57.5 (meter)
Average pedal force: 349.8 (N)

Performance Requirements:
Stop Number 1 must be less than: **89.1 (meter)**
In addition the stopping distance for at least one of the of the two hot stops must be less than: **89 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.85	296	312	259	253	94.9	93.3	181.39	110.11	8.65	4.57
2	99.73	308	323	267	263	64.1	64.4	424.53	311.80	8.67	5.82

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	NORTH	YES

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/05/09

DATA SHEET 28 - BRAKE COOLING STOPS AT GVWR

Testing Conditions: INV DATA, Section 0100, 03/05/09, 07:37:44

Schedule:
Initial Brake Temperature:
Achieved on completing Hot Performance
Initial Speed 50 km/h to zero
4 stops with transmission in gear

Performance Requirements:
Constant Decel rate: 3.0 m/s/s
Pedal force adjusted as necessary
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	AVG. DECEL (m/sec^2)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)
1	50.97	2.50	46.55	287	292	237	234
2	51.16	2.79	46.72	253	252	201	198
3	50.63	2.96	47.35	215	219	171	170
4	50.69	2.89	46.95	177	187	145	145

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	EAST	YES
3	-	NOX	EAST	YES
4	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

Vehicle: 2009 HYUNDAI MOTOR C NHTSA NUMBER: C90507
Make: HYUNDAI
Model: AZERA GLS
Body Style: 4 DOOR SEDAN
Front Cold Tire Pressure: 210 (Kpa)
Rear Cold Tire Pressure: 210 (Kpa)

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Date Tested: 03/05/09

DATA SHEET 29 - RECOVERY PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0105, 03/05/09, 07:43:52

Weather Conditions: 32°F Wind: 5 mph 214° Start Odo.: 631 End Odo.: 649

Schedule:
Make 2 stops from 100 kph
Pedal Force: Both stops are performed with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.

Performance Requirements:
One of the two stops must be within the following limits:
Upper limit of corrected stopping distance: **77.8 (meter)**
Lower limit of corrected stopping distance: **41.7 (meter)**

No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is:Stop6
Initial speed of stop: 100.79 (kph)
Actual distance of stop: 57.5 (meter)
Average pedal force: 349.8 (N)

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.58	174	185	142	142	52.1	52.5	340.78	214.56	14.87	7.58
2	101.19	191	204	152	152	50.3	49.1	374.06	149.18	13.12	4.98

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES

Comments: See Appendix C.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: JERRY INMAN Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date: 03/10/09
Approving Laboratory Official: RANDY LANDES Date: 03/12/09

DATA SHEET 30 (Part 1 of 5)
6.0 Test Completion Inspection (7.17)

VEHICLE: 2009 Hyundai Azera GLS NHTSA NO.: C90507 ODO.: 626 mi. DATE: 03/06/09

System Integrity (S5.6)

Each vehicle shall meet the complete performance requirements of this standard without:
(a) Detachment or fracture of any component of the braking system such as brake springs and brake shoes or disc pad facings, other than minor cracks, that do not impair attachment of the friction facings. All mechanical components of the braking system shall be intact and functional. Friction facing tearout (complete detachment of lining) shall not exceed 10 percent of the lining on any single frictional element.
(b) Any visible brake fluid or lubricant on the friction surface of the brake or leakage at the master cylinder or brake power unit reservoir cover, seal, and filler openings.

Friction Material Condition: Primary/Inner		**Friction Material Condition: Secondary/Outer**	
LF	Normal Appearance & Color	LF	Normal Appearance & Color
RF	Normal Appearance & Color	RF	Normal Appearance & Color
LR	Normal Appearance & Color	LF	Normal Appearance & Color
RR	Normal Appearance & Color	RR	Normal Appearance & Color
Drum (or Rotor) Condition:		**Brake Fluid/Lubricant Inside Brakes:**	
LF	Normal Appearance & Color	LF	None
RF	Normal Appearance & Color	RF	None
LR	Normal Appearance & Color	LR	None
RR	Normal Appearance & Color	RR	None
Hydraulic Component Condition:		**Mechanical Component Condition:**	
LF	Good	Brk/Pedal	Good
RF	Good	Power Brk	Good
LR	Good	Stop/Lamp	Good
RR	Good	Linkage	Good
M/Cyl	Good	Other	NA

COMPLIANCE: Yes_X_ No____
Comments: None.

Technician: Jerry Inman

DATA SHEET 30 (Part 2 of 5)
TEST COMPLETION INSPECTION (S7.17)

VEHICLE: 2009 Hyundai Azera GLS; NHTSA NO.: C90507; GVWR: 2150 kg
MASTER CYLINDER RESERVOIR:

DATE	03/09/09	Requirements	Pass	Fail
Reservoir Compartments (S5.4.1)				
(1) Does master cylinder have a reservoir compartment for each brake subsystem?	***Yes***	Master cylinder shall have a reservoir compartment for each subsystem.	X	
	No			
(2) Does loss of fluid in one compartment result in complete loss from another compartment?	Yes	Loss of fluid from one compartment shall not cause complete loss from another compartment.	X	
	No			
Reservoir Capacity (S5.4.2)				
Shall conform to requirements (1) or (2), state units: (1) For reservoirs having completely separate compartments for each subsystem (two separate, independent reservoirs):				
Subsystem 1 Subsystem reservoir capacity		Each compartment (reservoir) shall have a minimum capacity equivalent to the fluid displacement resulting when all wheel cylinders or caliper pistons serviced by that independent compartment/reservoir moves from a new lining, fully retracted position to a fully worn, properly adjusted, fully applied position. **(Use Data Sheet 31 and Appendix 1A)**	NA	NA
Subsystem 1 Fluid displaced from new to worn lining				
Subsystem 2 Subsystem reservoir capacity			NA	NA
Subsystem 2 Fluid displaced from new to worn lining				
2) For reservoirs utilizing a portion of the reservoir for a common supply to two or more subsystems:				
Total minimum capacity for the entire master cylinder reservoir (includes individual compartment reservoirs)	388 ml	Shall have total minimum capacity for entire reservoir for displacement resulting from all subsystem wheel cylinders or caliper positions moving from new lining to full worn condition as above.	X	
Fluid displaced from new to worn linings (ALL linings) *Value calculated from Data Sheet 31	136.4 ml*			

Comments: None.

Technician: Jerry Inman

DATA SHEET 30 (Part 3 of 5)
TEST COMPLETION INSPECTION (S7.18)

VEHICLE: 2009 Hyundai Azera GLS; NHTSA NO.: C90507; GVWR: 2150 kg

MASTER CYLINDER RESERVOIR:

DATE	03/09/09	Requirements	Pass	Fail
Master Cylinder Piston Displacement(S5.4.2) [If Common Reservoir Supply - continued from previous page]				
Fluid displaced by three strokes of master cylinder piston for Subsystem No. 1.	24.0 ml	Individual partial compartments of reservoir shall **each** have a minimum of fluid equal to at least the volume displaced by the master cylinder piston servicing the subsystem during a full stroke of the piston. **NOTE:** Procedure uses three strokes to ensure an accurate measurement.		
Fluid displaced by three strokes of master cylinder piston for Secondary (Subsystem No. 2)	23.0 ml			
Fluid displaced per stroke, Subsystem No. 1.	8.0 ml			
Fluid displaced per stroke, Subsystem No. 2.	7.7 ml			
Fluid available in partial compartment Subsystem No. 1	42 ml		X	
Fluid available in partial compartment Subsystem No. 2	37 ml		X	
Brake Power Unit Reservoir (S5.4.2)				
Volume displaced in charging system piston or accumulator to normal operating pressure plus wheel cylinder or caliper piston displacement.		Shall have a capacity at least equal to fluid displacement required to charge the system pistons on accumulators to normal operating pressure plus displacement when wheel cylinders or caliper pistons move from new lining to full worn condition as above.	NA	
Reservoir Labeling (S5.4.3)				
Exact copy of reservoir label: On top of master cylinder reservoir: WARNING. CLEAN FILLER CAP BEFORE REMOVING. USE ONLY DOT 3 OR 4 BR-AKE FLUID FROM A SEALED CONTAINER.		Label shall read: "Warning, clean filler cap before removing; use only * fluid from a sealed container". * Fluid type specified in 49 CFR 571.116	X	
Measure letter height	3.2 mm	Letters shall be at least 3.2 mm/ 0.125" high	X	
Describe label attachment method and location. Embossed on top of the master cylinder reservoir filler cap.		Lettering shall be permanently affixed, engraved or embossed and located so as to be visible by direct view either on or within 100 mm/3.94 inches of the brake fluid reservoir filler plug or cap.	X	
Does the lettering contrast with the background?	Yes ***No***	If label is not engraved or embossed, letters shall be of a color that contrasts with the background	N/A	

Comments: None.

Technician: Jerry Inman

DATA SHEET 30 (Part 4 of 5)
TEST COMPLETION INSPECTION (S7.18)

VEHICLE: 2009 Hyundai Azera GLS ; NHTSA NO.: C90507; DATE: 03/09/09

BRAKE SYSTEM WARNING INDICATOR (S5.5)

CONDITION	ANSWER	REQUIREMENTS	PASS	FAIL
Brake Systems Indicator Lamp Function Check (S5.5.2) (Bulb and systems check)				
Describe location of brake indicator lamp: Mid-line, left hand quadrant of the instrument cluster (within tachometer nacelle).	NA	Shall be in front, and in clear view, of driver.	X	
Does lamp light with ignition (start) switch at ON/RUN?	Yes	Automatic activation when ignition switch is "on" when engine **not running**, or ignition between "on" and "start" if is manufacturer check position- OR -single manual action by driver	X	
Does lamp light with ignition between ON and Start?	Yes			
Brake check description in owner's manual?	Yes	Manufacturer shall explain the brake check function test procedure in the owner's manual.	X	
Brake System Warning Indicator ACTIVATION (S5.5.1) DURATION (S5.5.3) FUNCTION (S5.5.4)				
CONDITION	**Light ON?**	**REQUIREMENT**	**PASS**	**FAIL**
A. In event of hydraulic leak (1) On or before appearance of pressure differential of 218 psi (split system)	NA	When ignition (Start) switch is **ON**, lamp must light whenever (A), (B), (C), or (D) occurs. In addition, if service brake system is not a split system, audible warning must be activated when any condition in (A) exists. Visual warning indicator for non-split systems must be flashing.	X	
(2) If any reservoir falls below either "safe" level or 25% of capacity, whichever is greater. Values: **123 ml** or cc (ON at "min" mark).	Yes			
(3) On or before supply pressure to brake power unit falls to 50%	NA			
B. Electrical functional failure in an antilock or variable brake proportioning system.	Yes		X	
C. Application of the parking brake.	Yes			
D. Brake lining wear-out if optical warning.	NA			
E. *For a vehicle with electrically-actuated service brakes, failure of the source of electric power to the brakes or diminution of state of charge of the batteries.*	NA			
F. *For a vehicle with electric transmission of the service brake control signal, failure to a brake control circuit.*	NA			
G. *For an EV with RBS that is part of the service brake system failure of RBS.*	NA			
Must have Audible alarm if not split system and a condition in (a) above exists?	NA			
If condition (A) (2) above does not exist, then fluid reservoir must be **transparent** for fluid check without the need for reservoir to be opened? (S5.4.4)	NA			
Indicator lamps remain activated as long as condition exists - ignition "on", and engine on or off? _____ (S5.5.3 DURATION))	Yes			
Visual warning – continuous or flashing? Audible warning –continuous or flashing?	Yes-Cont. No			

Comments: None.

Technician: Jerry Inman

DATA SHEET 30 (Part 5 of 5)
TEST COMPLETION INSPECTION (S7.18)

VEHICLE: 2009 Hyundai Azera GLS; NHTSA NO.: C90507; DATE: 03/09/09

BRAKE SYSTEM WARNING INDICATOR LABELING (S5.5.5)

CONDITION AND REQUIREMENT	ANSWER NOTE: Standard requires that the answer to questions be YES	PASS	FAIL
Are visual indicators legible to driver in daylight and nighttime conditions when activated?	Yes	X	
Are visual indicator words 3.2 mm (.125") high minimum? Record Height: "Brake" – 3.2 mm; "ABS" – 3.2 mm.	Yes	X	
Visual indicator words and background contrasting colors, one of which is red. Record colors Letters –Red, Lens – Black	Yes	X	
If split system, is there one brake indicator? If yes, does it say the word "BRAKE"? (With two symbols above.)	Yes	X	
If not split system; is there a separate indicator for loss of fluid or fluid pressure? Does this indicator say "Stop-Brake Failure"? Are the letters block and not less than 6.4 mm (.25") in height? Record letter height_____	NA		
If separate indicator for: 1. Low brake fluid per S5.5.1(a)(1), does indicator say "Brake Fluid"? NOTE: not required for mineral oil system Record wording: 2. Gross pressure loss per S5.5.1(a)(2), does indicator say "Brake Pressure"? Record wording _____ 3. Electrical functional failure in antilock or variable proportioning system per S5.5.1(b), letters and background contrasting colors one of which is yellow? Record colors Lens – Black, Letters – Yellow. Does indicator say "Antilock" or "ABS" or "Brake Proportioning"? Record wording: "ABS" within a symbol. 4. Parking brake per S5.5.1(c), does indicator say "Park" or "Parking Brake"? Record wording: 5. Brake lining wear-out per S5.5.1(d), does indicator say "Brake Wear"? Record wording -_____ 6. *If separate indicator for RBS, the letters and background shall be of contrasting colors, one of which is yellow. The indicator shall be labeled "RBS". RBS failure in a system which is part of the service brake system may also be indicated by a yellow lamp that also indicates "ABS" failure and displays the symbol "ABS/RBS." Record wording:* 7. For any other function? If yes, Record NA	NA NA Yes Yes NA NA NA NA	X	

DATA INDICATES COMPLIANCE: YES X NO_____

Comments: None.

Technician: Jerry Inman

DATA SHEET 31 (Part 1 of 2)
CALCULATION OF MINIMUM RESERVOIR VOLUME REQUIREMENTS

VEHICLE: 2009 Hyundai Azera GLS; NHTSA NO.: C90507; DATE: 03/06/09

BRAKE		LINING		
LOCATION	TYPE	DESCRIPTION	MINIMUM THICKNESS	THICKNESS TO FULLY WORN (1) mm*
Left Front	Drum	Leading	Pre-test 10.64 mm	2.0
		Primary	Post Test 10.29 mm	
		Inboard X	Δ 0.35 mm	
	Disc X	Trailing	Pre-test 10.62 mm	2.0
		Secondary	Post Test 10.24 mm	
		Outboard X	Δ 0.38 mm	
LINING CLEARANCE:	Diametrical (2): N/A	Inboard – 0.25 mm.	Outboard – 0.25 mm.	
WHEEL CYLINDER DIAMETER (3) N/A		CALIPER PISTON DIAMETER (3): 59.94 mm (x1 piston).		
SHOE CAGE DIAMETER (4) N/A ; CENTER POINT OF BRAKE ASSY TO CENTER POINT OF W.C. N/A				
Right Rear	Drum	Leading	Pre-test 9.83 mm	2.0
		Primary	Post Test 9.42 mm	
		Inboard X	Δ 0.41 mm	
	Disc X	Trailing	Pre-test 9.55 mm	2.0
		Secondary	Post Test 9.12 mm	
		Outboard X	Δ 0.43 mm	
LINING CLEARANCE:	Diametrical (2) N/A mm	Inboard – 0.25 mm	Outboard – 0.25 mm	
WHEEL CYLINDER DIAMETER (3): N/A		CALIPER PISTON DIAMETER (3): 35.05 mm (x1 piston).		
SHOE CAGE DIAMETER (4): N/A		CENTER POINT OF BRAKE ASSY TO CENTER PT. OF W.C.: N/A		
CIRCUIT #1 CONSISTS OF:	LF	LR - X	RF- X	RR
CIRCUIT #2 CONSISTS OF:	LF - X	LR	RF	RR - X
(1) MFRS. RECOMMENDATIONS – FRONT and REAR: 2.0 mm. (2) REAR – 0.25 mm. FRONT – 0.25 mm.				
(2) DRUM BRAKES, MEASURED AT HORIZONTAL CENTERLINE: NA.				
(3) MFRS. DATA: FRONT – 60 mm, 1 piston; REAR – 34 mm, 1 piston. (4) RESET POSITION: NA.				

Comments: Manufacturer's total thickness (new linings) data: Frts.: 11.0 mm; Rears: 10.0 mm.

Technician: D. Bevis

DATA SHEET 31 – SECTION CONTINUED (Part 2 of 2)

Vehicle: 2009 Hyundai Azera GLS; NHTSA No.: C90507; Date: 03/16/09

Procedure and Example for Determining Master Cylinder Volume Requirement

The procedure followed for determining the minimum volume requirements is outlined in the example shown below. The required data is taken from the previous page, both measured and manufacturer's data.

DISC BRAKES

Volume Required, $V_r = (\Delta t_i + t_{ic} + \Delta t_o + t_{oc}) \times [\pi (D^2)]/4$, where –

V_r = Volume required per wheel
Δt = Change in thickness (average)
i = Inboard
o = Outboard
D = Caliper cylinder diameter
c = Average clearance

Using the above equations, the volume requirements for Subsystem No. 1 (RF/LR) and Subsystem No. 2 (LF/ RR) were calculated utilizing measured and manufacturer's provided data to create the greatest displacement, as shown below:

Disc Brake: (Front)

$$V_r = (\Delta t_i + t_{ic} + \Delta t_o + t_{oc}) \times \frac{\pi D^2}{4}$$

Δt_i = 9 mm
Δt_o = 9 mm
$t_{ic} + t_{oc}$ = 0.5 mm
D = 57.2 mm

$$V_r = (9 + 0.25 + 9 + 0.25) \frac{\pi (60)^2}{4}$$

$$= 18.5 (2827.4)$$
$$= 52307.5 \text{ mm}^3 = 52.3 \text{ ml (x1 Piston)} = 52.3 \text{ ml}$$

Disc Brake: (Rear)

$$V_r = (\Delta t_i + t_{ic} + \Delta t_o + t_{oc}) \times \frac{\pi D^2}{4}$$

Δt_i = 8 mm
Δt_o = 8 mm
$t_{ic} + t_{oc}$ = 0.5 mm
D = 38.18 mm

$$V_r = (8 + 0.25 + 8 + 0.25) \frac{\pi (35.05)^2}{4}$$

$$= 16.5 (964.9)$$
$$= 15920.2 \text{ mm}^3 = 15.9 \text{ ml (x1 Piston)} = 15.9 \text{ ml}$$

For System 1 (RF & LR)

$V_{r1} = 52307.5 \text{ mm}^3 + 15920.2 \text{ mm}^3 = 68227.7 \text{ mm}^3$
$V_{r1} = 68227.7 \text{ mm}^3 = (68.2 \text{ ml})$

For System 2 (LF & RR)

$V_{r2} = V_{r1}$
$V_{r2} = 68227.7 \text{ mm}^3 = (68.2 \text{ ml})$

TOTAL VOLUME REQUIRED = $V_t = V_{r1} + V_{r2} = 68.2 + 68.2 = 136.4$ ml*

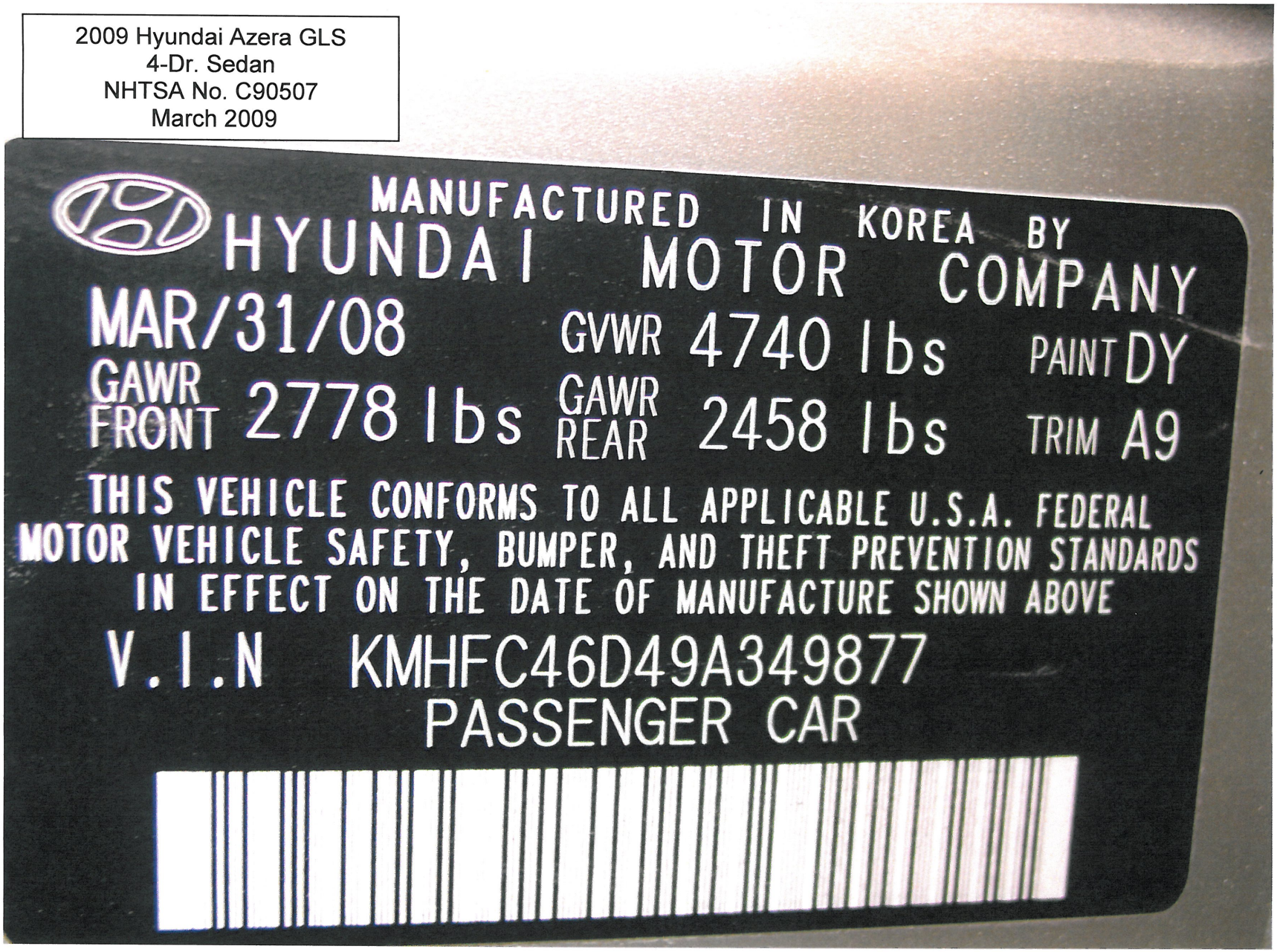
Section 6.0

Photographs

Left Front 3/4 View

Right Rear 3/4 View

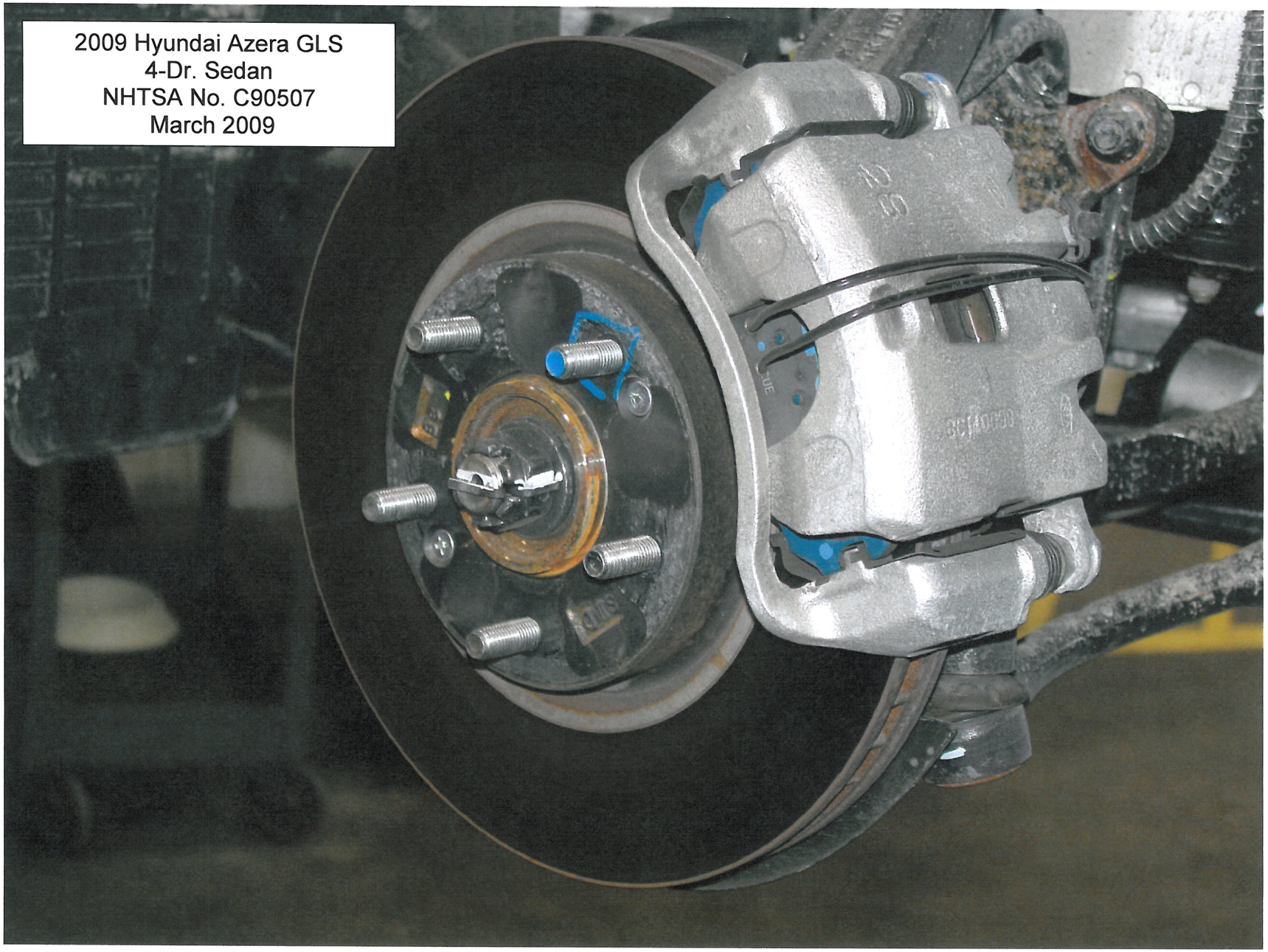
2009 Hyundai Azera GLS
4-Dr. Sedan
NHTSA No. C90507
March 2009



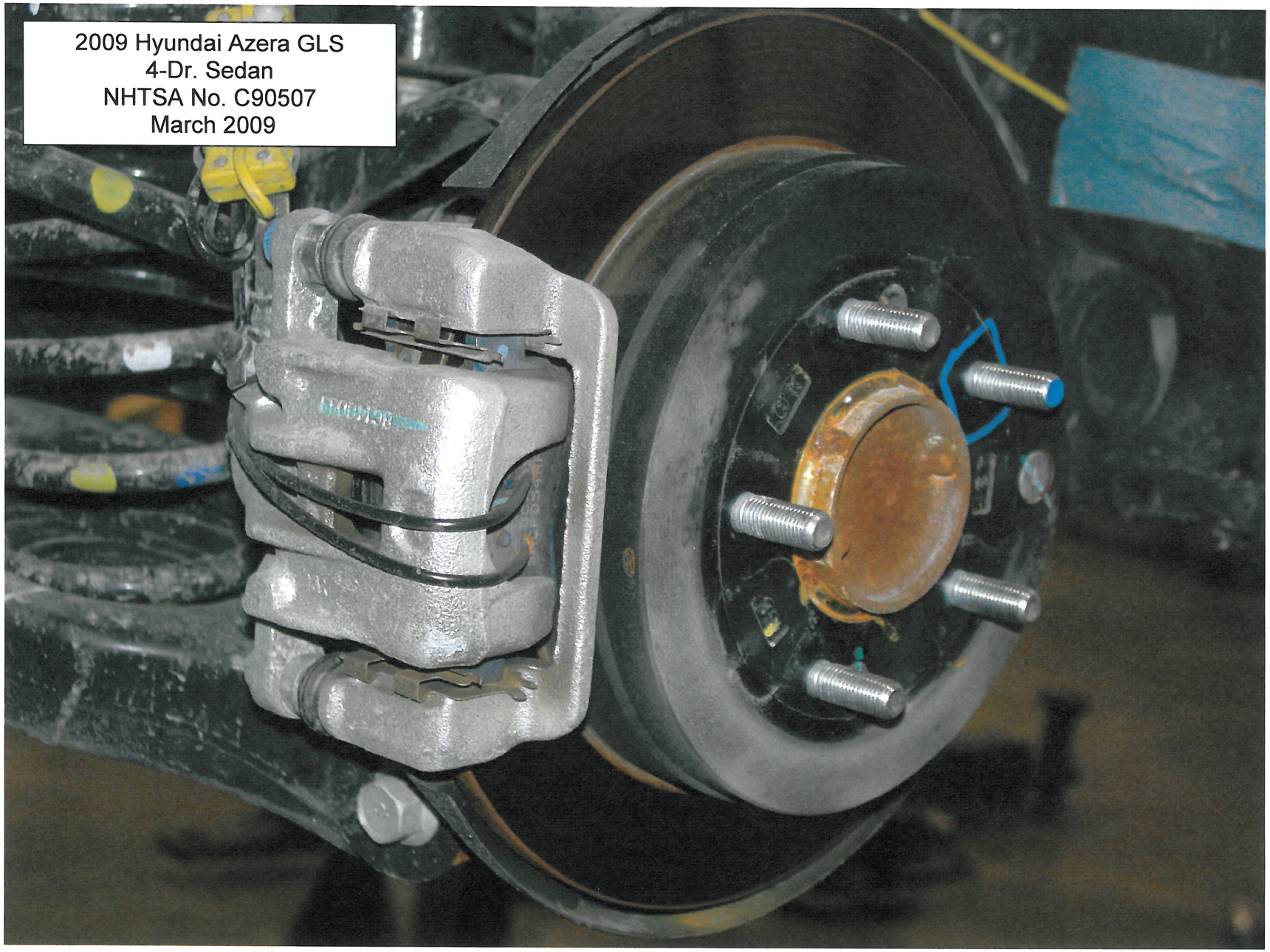
Vehicle Certification Placard

2009 Hyundai Azera GLS
4-Dr. Sedan
NHTSA No. C90507
March 2009

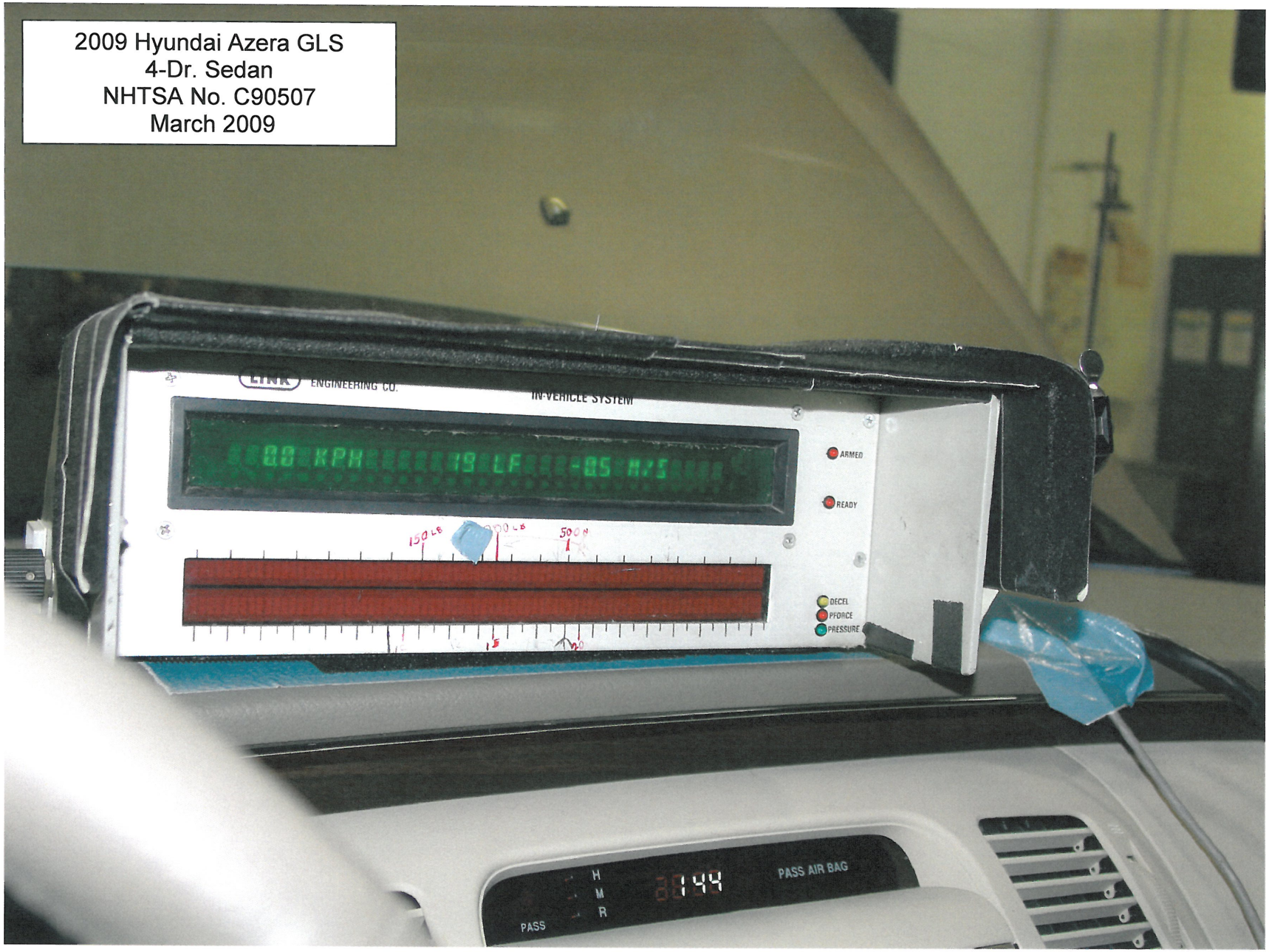
Vehicle Tire Information Label



Left Front Thermocouple Installation



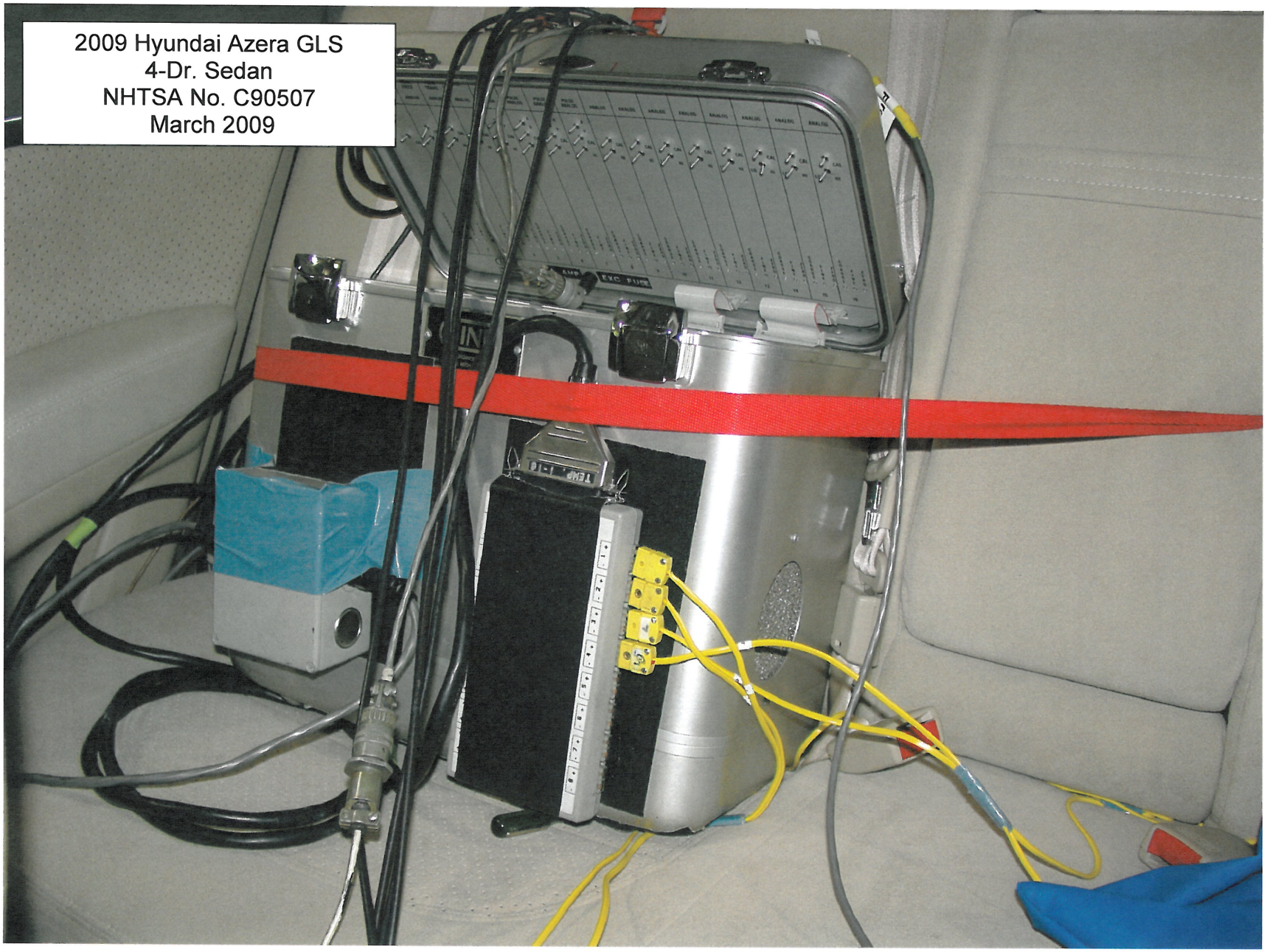
Right Rear Thermocouple Installation



Test Instrumentation in Vehicle

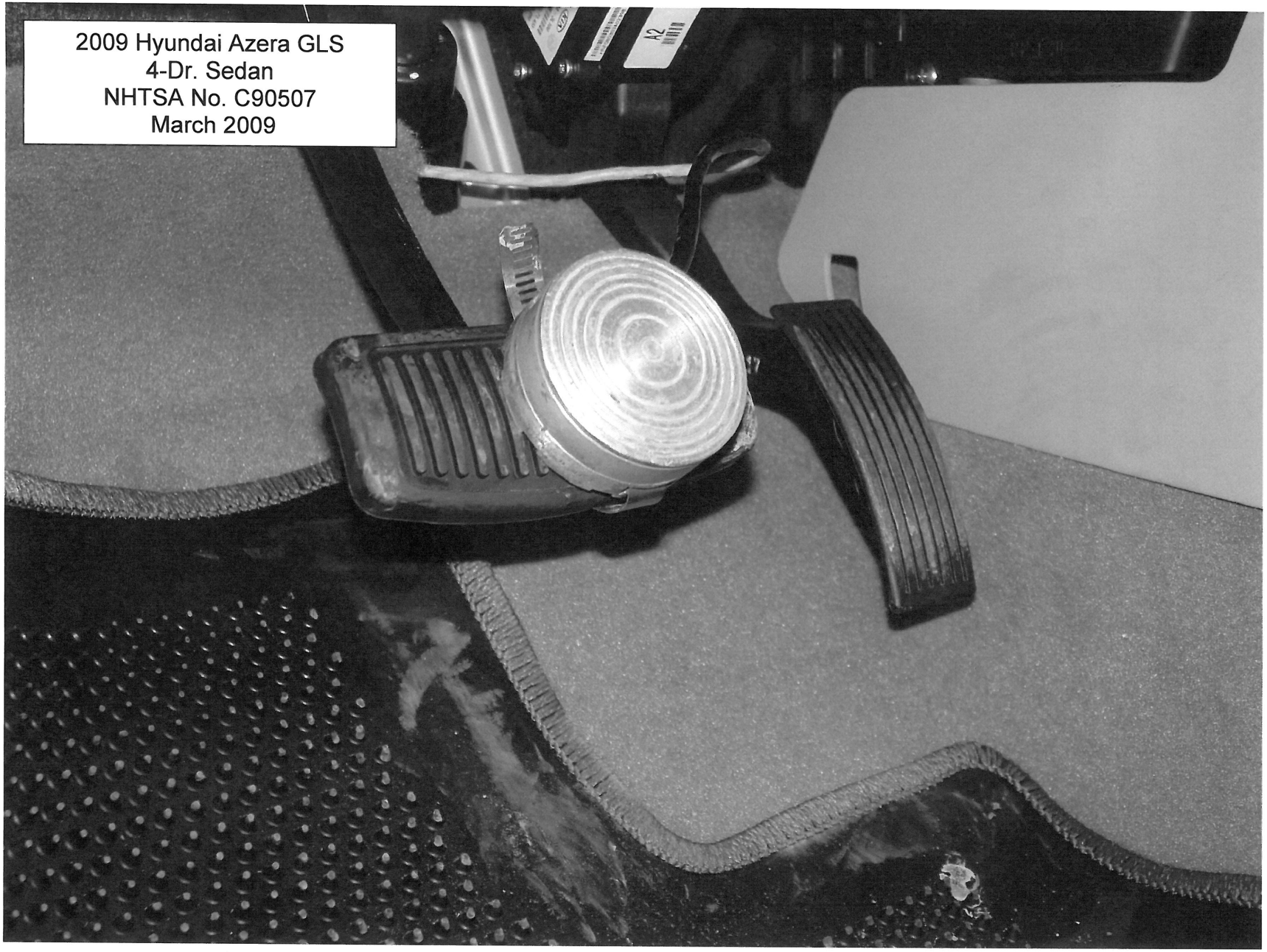
2009 Hyundai Azera GLS
4-Dr. Sedan
NHTSA No. C90507
March 2009

Test Instrumentation in Vehicle



Test Instrumentation in Vehicle

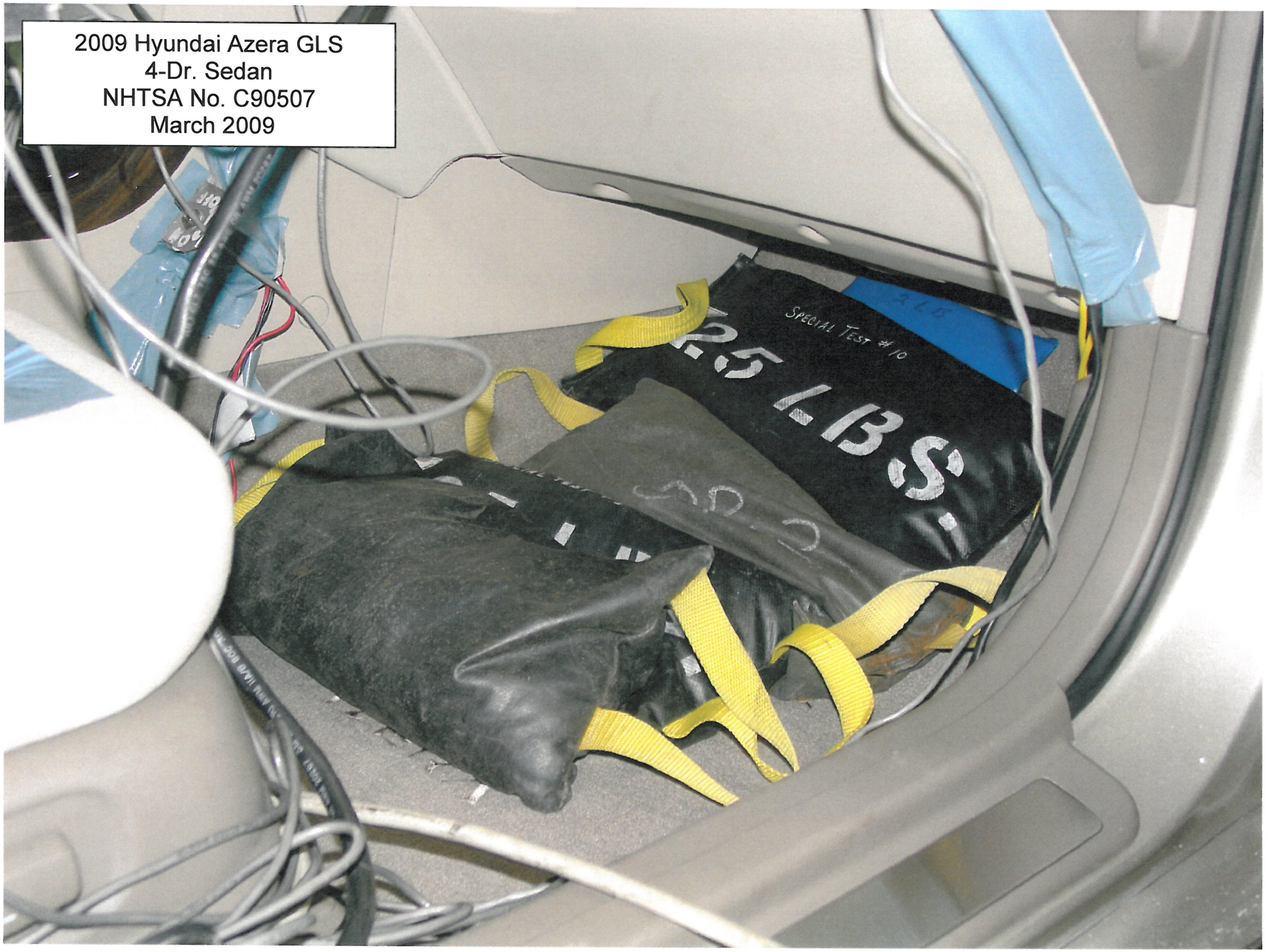
Test Instrumentation in Vehicle



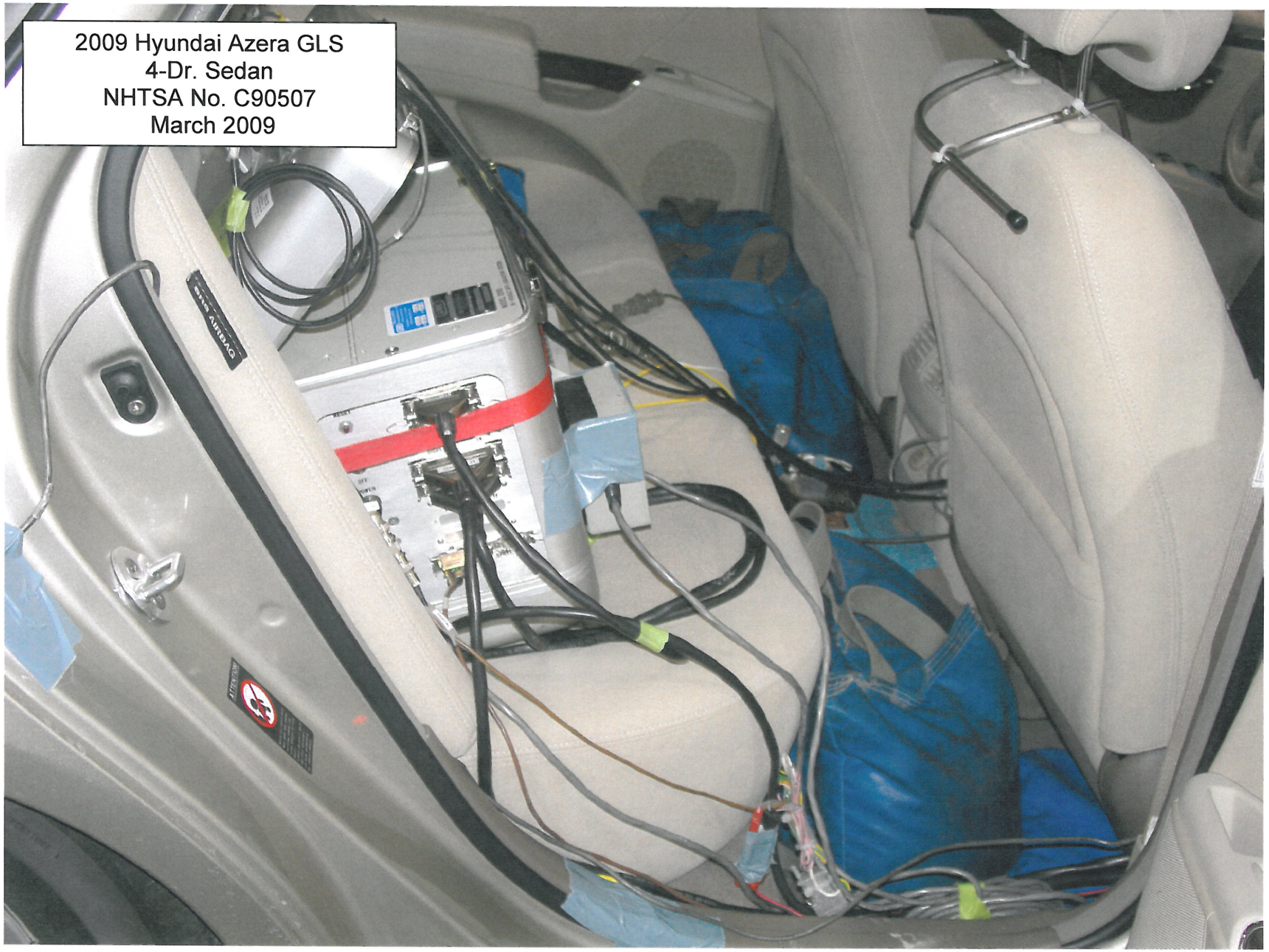
Test Instrumentation in Vehicle

Vehicle Being Weighed

Ballast in Vehicle



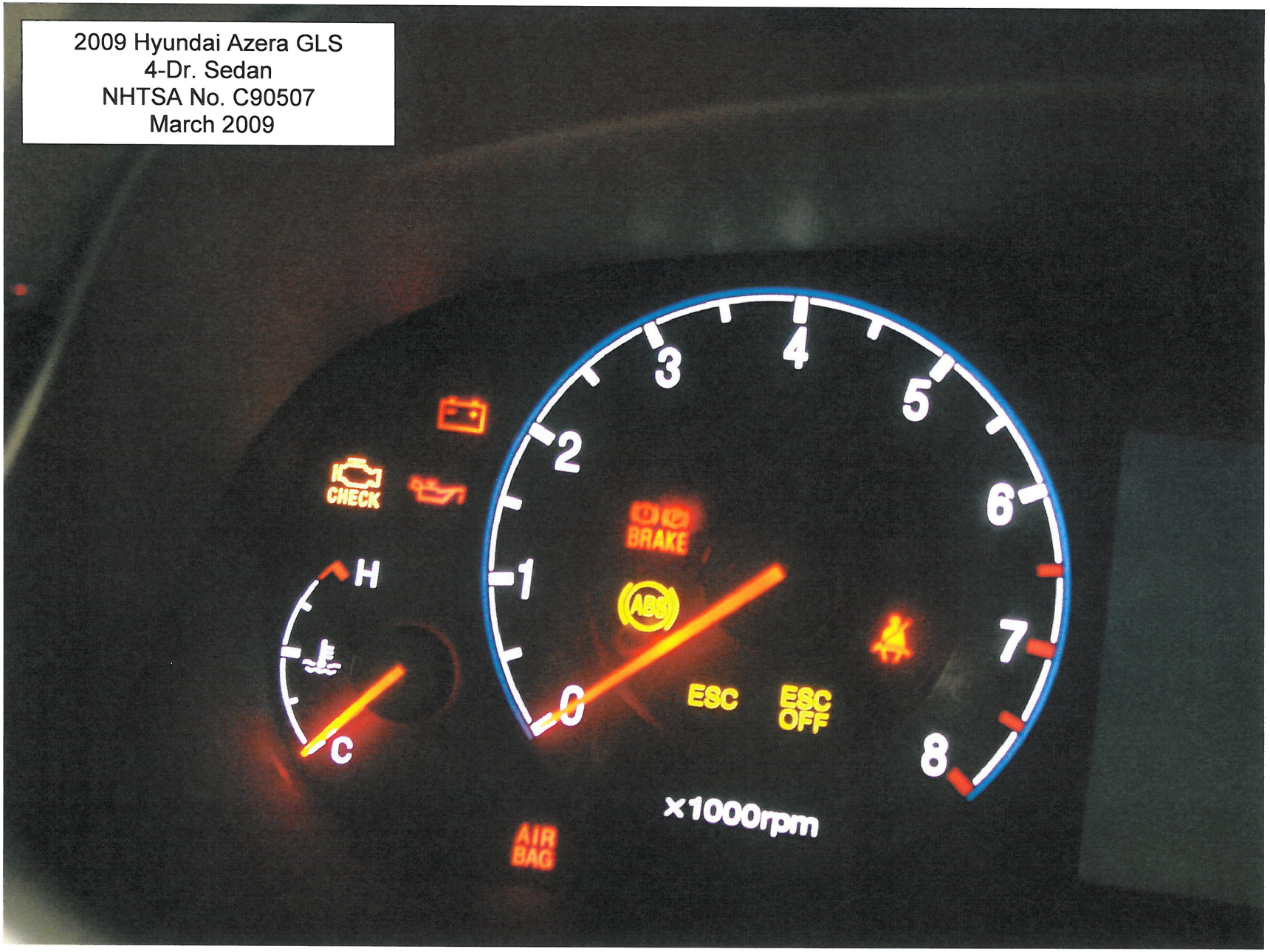
Ballast in Vehicle



Ballast in Vehicle

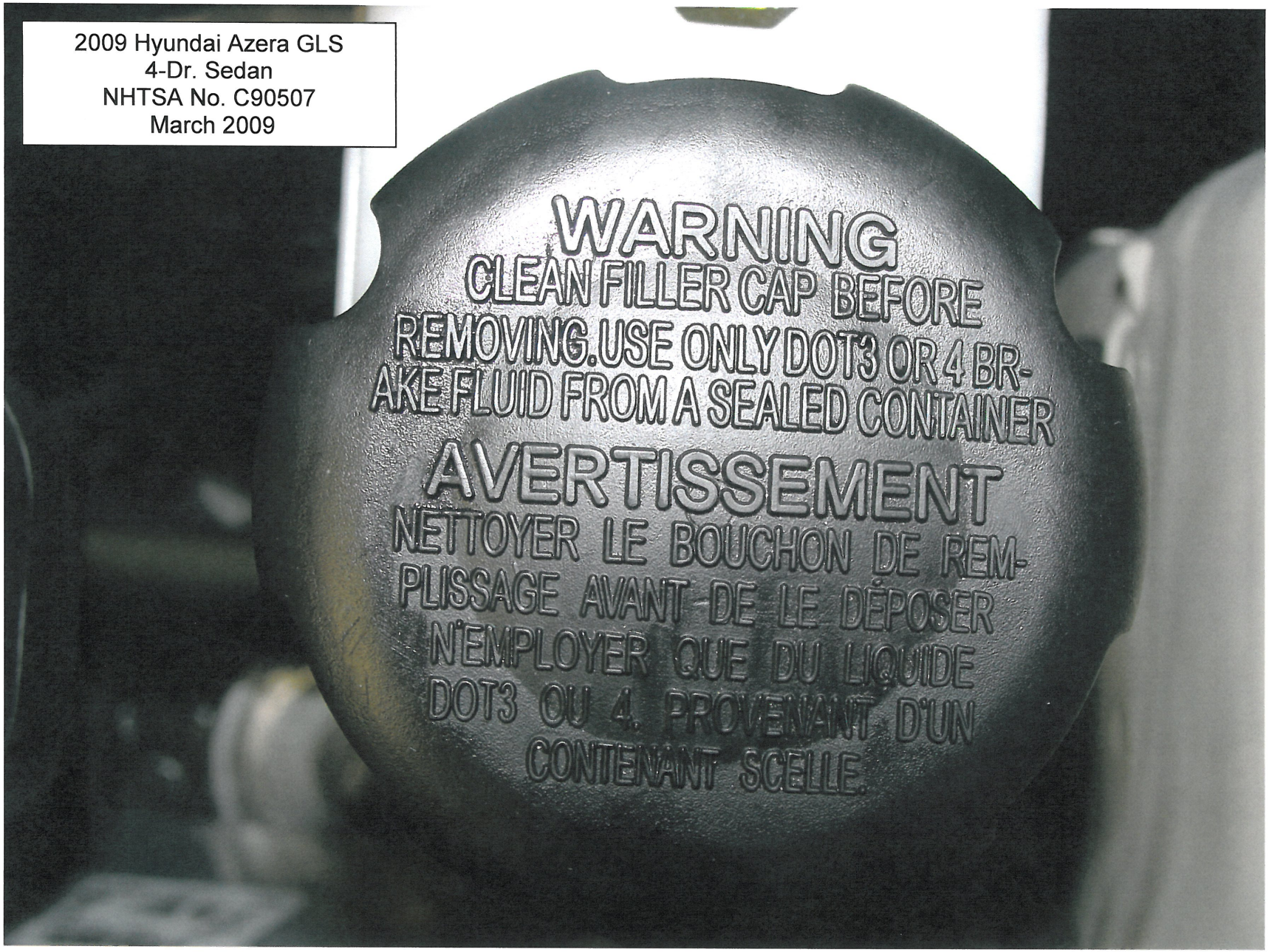
Ballast in Vehicle

2009 Hyundai Azera GLS
4-Dr. Sedan
NHTSA No. C90507
March 2009



Brake System Indicator (Warning) and ABS Warning Lamps

2009 Hyundai Azera GLS
4-Dr. Sedan
NHTSA No. C90507
March 2009



Brake Fluid (Master Cylinder) Reservoir Warning Label

7.0 INSTRUMENT CALIBRATION (12 MONTH MAXIMUM INTERVAL)

VEHICLE: 2009 Hyundai Azera GLS ; NHTSA NO.: C90507; DATE: 02/23/09

INSTRUMENT	SERIAL NUMBER	CALIBRATION DATE	NEXT CALIBRATION
Data Acquisition System - Link DAS 2030	955009	11/10/08	11/10/09
Computer – Dell/Link Engrg.	TRC-43366	Not Applicable	Not Applicable
Software - Link Engrg. Rev Data	TRC Propr.	NA	NA
LF Torque Wheel	Not Utilized		
RF Torque Wheel	Not Utilized		
LR Torque Wheel	Not Utilized		
RR Torque Wheel	Not Utilized		
Stopwatch – Fisher Scientific (Heating Snubs)	SN-97216633	08/27/08	08/27/09
Stopwatch – Accusplit (Daily Cals)	SW-ST03	08/27/08	08/27/09
Tire Pressure Gauge – WIKA	AG-101 97216633	02/05/09	05/05/09
Pedal Force Transducer – GSE	074, 4351-300	Each Test	Each Test
Asst. Pipe-Handle Steel Weights - Ohaus	LB-0001	06/04/08	06/04/09
Park Brake Force Transducer – Interface	LC-41721	Each Test	Each Test
LF Hydraulic Pressure Transducer	Not Utilized		
RF Hydraulic Pressure Transducer	Not Utilized		
LR Hydraulic Pressure Transducer	Not Utilized		
RR Hydraulic Pressure Transducer	Not Utilized		
Accelerometer - Setra (+ or – 15 g) 141A	A-1055763	Each Test	Each Test
Fifth Wheel – ADAT DSR-06 Radar	140.0082	Each Test	Each Test
Wind Velocity/Direct. – Davis Model 6410	050608N22	07/13/08	07/13/09
Ambient Temp. Gage–Davis Mod. 6150	050608N02	07/13/08	07/13/09
LF Brake Thermocouple - Temprel/Link	T52-0B-24K	Ea. Test w/Link	Ea. Test w/Link
RF Brake Thermocouple - Temprel/Link	T52-0B-24K	Ea. Test w/Link	Ea. Test w/Link
LR Brake Thermocouple - Temprel/Link	T52-0B-24K	Ea. Test w/Link	Ea. Test w/Link
RR Brake Thermocouple - Temprel/Link	T52-0B-24K	Ea. Test w/Link	Ea. Test w/Link
Lock-up Detection System	TRC Propr.	Each Test	Each Test
Vehicle Weight – Toledo/Mettler Scales JAGXTREME 3000000, (Bldg. 70)	SN 5225831-5JG	02/18/09	05/18/09

QUALITY ASSURANCE

DAILY CALIBRATIONS (1 of 3)

Vehicle: 2009 Hyundai Azera GLS NHTSA No.: C90507

Deceleration Calibration Data for Unit 9354
Desired full scale value is: 9.81 m/s/s
Allowed deviation is: + or - 0.15 m/s/s

Accelerometer	Level to zero, then tilt to full scale	"Date"	"Time"	Zero	Cal	
		"stp"	"stp"	"Decel"	"Decel"	
		2/23/2009	9:02:57	0.03	9.82	PRE TEST CAL
		2/24/2009	8:54:46	0.04	9.76	
		2/24/2009	15:23:16	0.08	9.98	
		2/25/2009	8:23:22	0.07	9.90	
		2/25/2009	15:00:23	0.02	9.92	
		2/26/2009	10:09:00	0.09	9.71	
		2/26/2009	15:19:51	-0.02	9.82	
		3/2/2009	7:54:30	0.02	9.78	
		3/3/2009	8:08:13	0.02	9.82	
		3/3/2009	14:10:22	-0.01	9.96	
		3/4/2009	8:29:07	0.04	9.82	
		3/4/2009	14:57:02	0.04	9.73	
		3/5/2009	7:05:39	0.02	9.83	
		3/5/2009	8:24:22	0.01	9.82	
		3/5/2009	11:22:35	0.02	9.79	POST TEST CAL

Pre-Test Linearity Check 02/23/2009

Actual (m/s/s)	Rec. (m/s/s)
0.0	0.0
3.0	3.0
6.1	6.1
9.8	9.8

Post-Test Linearity Check 03/05/2009

Actual (m/s/s)	Rec. (m/s/s)
0.0	0.0
3.0	3.0
6.1	6.1
9.8	9.8

Distance Calibration Data for Unit 9354
Desired full scale value is: 1000 m
Allowed deviation is: 3 m

Light beam distance sensor	Drive from 0 to 100 to 0 km/h on a measured kilometer	"Date"	"Time"	Distance for
		"stp"	"stp"	1000 meters
		2/24/2009	9:30:10	1000.1
		2/24/2009	15:25:02	983.4
		2/25/2009	8:44:04	1000.5
		2/26/2009	10:29:37	1000.3
		2/26/2009	15:22:19	1003.1
		3/2/2009	8:17:32	1000.4
		3/3/2009	8:20:50	1000.1
		3/3/2009	14:19:07	998.2
		3/4/2009	8:40:20	1000.0
		3/4/2009	15:00:10	999.8
		3/5/2009	7:07:58	1000.2
		3/5/2009	8:33:40	999.8

DAILY CALIBRATIONS CONTINUED (2 of 3)

Vehicle: 2009 Hyundai Azera GLS NHTSA No.: C90507

Wheel Tachometer Calibrations for Unit 9354

Wheel tachometer calibrations: all wheel speeds should be 15 km/h

Wheel Lock Detector — While at a standstill, check zeros. Drive vehicle at approx. 15 km/h and engage zero speed switch for each wheel

"Date"	"Time"	Zero	@15km/h	Zero	@15km/h	Zero	@15km/h	Zero	@15km/h
stp	stp	LF	LF	RF	RF	LR	LR	RR	RR
2/26/2009	10:37:18	0.0	22.1	-0.1	20.2	-0.1	21.7	0.0	22.9
2/26/2009	15:24:37	0.0	25.3	-0.1	23.0	-0.1	24.9	0.0	26.2
3/2/2009	8:23:30	0.0	24.9	-0.1	23.0	-0.1	24.3	0.0	25.1
3/3/2009	8:09:44	0.0	22.4	-0.1	20.3	-0.1	22.2	0.0	23.2
3/3/2009	14:11:45	0.0	22.2	-0.1	19.7	-0.1	21.3	0.0	22.1
3/4/2009	8:30:58	0.0	24.2	-0.1	22.0	-0.1	23.8	0.0	25.4
3/4/2009	14:58:26	0.0	23.6	-0.1	21.5	-0.1	23.3	0.0	24.5
3/5/2009	7:06:31	0.0	24.1	-0.1	21.7	-0.1	23.7	0.0	24.8
3/5/2009	8:25:38	0.0	22.1	-0.1	20.1	-0.1	21.6	0.0	22.8

When driven over 15 km/hr and the wheel tack generators are shunted to zero volts, does the graphical screen indicate wheel lock atl position?: __X__ Yes, _____ No.

Pedal Force Meter Calibration for Unit 9354

Target shunt calibration is 797 N

Desired recorded value is: 797 N

Desired recorded actual force calibration check value is: 500 N

Allowed deviation is: 6.5 N

Service brk. pedal effort — Driver engages a fixed shunt cal switch.

"Date"	"Time"	Zero	Cal Val	
stp	stp	Force	Force lb	
2/24/2009	13:24:45	-0.3	499.7	PRE TEST CAL.
2/24/2009	15:52:00	-0.9	388.7	
2/25/2009	9:20:45	-0.4	388.4	
2/25/2009	15:37:52	-0.3	388.6	
2/26/2009	8:31:28	-0.4	388.8	
2/26/2009	15:11:11	-0.3	388.7	
3/2/2009	8:21:20	-0.2	388.6	
3/3/2009	8:26:57	-0.4	388.6	
3/3/2009	15:23:15	-0.3	388.7	
3/4/2009	8:30:22	-0.2	388.3	
3/4/2009	13:34:24	-0.3	388.5	
3/4/2009	14:30:58	-0.1	503.4	POST TEST CAL.

Pre-Test Linearity Check - 02/23/09

Actual Force (N)	Recorded Force (N)
0	0
222	223
445	445
498	498

Post-Test Linearity Check - 03/04/09

Actual Force (N)	Recrdd Frc(N)
0	0
222	223
445	445
498	497

Parking Brake Transducer Cal - Pre & Post-Test: Shunt Cal - 937N, Unit 9354 - 03/04/09

Actual Force (N)	Recorded Force (N)
0	0
222	223
445	445
498	498

DAILY CALIBRATIONS CONTINUED (3 of 3)

Vehicle: 2009 Hyundai Azera GLS NHTSA No.: C90507

Dynamic Speed Calibration for Unit 9354

Desired speed value is: 100 km/h
Allowed deviation is: 1.6 km/h
Desired time value is: 36 seconds
Allowed deviation is: + or - 0.6 seconds

Light beam speed sensor

Drive vehicle at a steady 100 km/h through a kilometer.

"Date"	"Time"	"Speed"	Time"
stp	stp	km/h	sec
2/24/2009	15:32:07	99.8	36.09
2/25/2009	8:47:14	100.5	36.02
2/26/2009	10:34:52	101.1	36.21
2/26/2009	15:26:58	99.9	36.28
3/2/2009	8:21:21	101.5	35.97
3/3/2009	8:24:27	99.9	36.26
3/3/2009	14:14:38	99.6	36.36
3/4/2009	8:43:47	100.3	36.71
3/4/2009	15:04:20	99.6	36.53
3/5/2009	7:11:48	99.6	36.12
3/5/2009	8:37:29	99.0	35.92

APPENDIX A

Copy of Manufacturer's Sticker

HYUNDAI 2009 AZERA GLS

Azera offers an unprecedented combination of safety, roominess, and luxury features

GOVERNMENT SAFETY RATINGS

Frontal Crash	Driver	★★★★
	Passenger	★★★★

Star ratings based on the risk of injury in a frontal impact.
Frontal ratings should ONLY be compared to other vehicles of similar size and weight.

Side Crash	Front seat	★★★★★
	Rear seat	★★★★★

Star ratings based on the risk of injury in a side impact.

Rollover ★★★★

Star ratings based on the risk of rollover in a single vehicle crash.

Star ratings range from 1 to 5 stars(★★★★★) with 5 being the highest.

www.safercar.gov or 1-888-327-4236

SMOG EMISSION INFORMATION

The SI of this vehicle is: 0.39

0.0 — 3.0

The SI of the average new vehicle is: 0.37

Note: The Smog Index (SI) indicates the relative level of smog-forming pollutants emitted by the vehicle. The lower the SI, the lower the vehicle's emissions.

PART CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:

U.S. / CANADIAN PARTS CONTENTS: 3 %

MAJOR SOURCES OF FOREIGN PARTS CONTENTS:
Korea 95 %

Note: Parts content does not include final assembly, distribution, or other non-parts costs.

FOR THIS VEHICLE:

FINAL ASSEMBLY POINT:
Asan, Korea

COUNTRY OF ORIGIN:
ENGINE: Korea
TRANSMISSION PARTS: Korea

EPA Fuel Economy Estimates

These estimates reflect new EPA methods beginning with 2008 models.

CITY MPG

18

Expected range for most drivers **14** to **22** MPG

Estimated Annual Fuel Cost

$1,999.00

based on 15,000 miles at $2.80 per gallon

Combined Fuel Economy

This Vehicle **21**

11 — 25

All Large Cars

HIGHWAY MPG

26

Expected range for most drivers **21** to **31** MPG

***-NOT AVAILABLE**

Your actual mileage will vary depending on how you drive and maintain your vehicle

See the Free Fuel Economy Guide at dealers or www.fueleconomy.gov

Class-leading Standard Safety Equipment

- Eight Airbags: Dual front, front and rear seat-mounted side impact airbags and roof-mounted side curtain airbags
- Electronic Stability Control (ESC) with Traction Control System (TCS) and Tire Pressure Monitoring System
- Anti-lock Braking System (ABS) with Brake Assist
- Active Head Restraints
- Anti-theft Engine Immobilizer

STANDARD FEATURES:

* Electronic Stability Control	INCLUDED
* Traction Control System	INCLUDED
* 4-Wheel Anti-Lock Brakes with Brake Assist	INCLUDED
* Front Seat Side Airbags	INCLUDED
* Side Curtain Airbags	INCLUDED
* Active Head Restraints	INCLUDED
* 3.3L MPI-DOHC V6 Engine w/ Variable Intake System	INCLUDED
* 5-Spd Automatic Transmission w/SHIFTRONIC® Function	INCLUDED
* 4-Wheel Disc Brakes	INCLUDED
* Tire Pressure Monitoring Sys	INCLUDED
* 17" 10-Spoke Alloy Wheels	INCLUDED
* Fully Independent Suspension	INCLUDED
* Remote Keyless Entry w/Alarm	INCLUDED
* Premium Full Cloth Seat Trim	INCLUDED
* Dual Front Power Seats	INCLUDED
* Split-Fold 60/40 Rear Seat	INCLUDED
* Dual Fully Automatic Non-CFC Air Conditioning	INCLUDED
* Electroluminescent Gauges	INCLUDED
* Leather Wrapped Steering Wheel w/ Tilt & Telescopic	INCLUDED
* Autodim Inside Rear Mirror	INCLUDED
* AM/FM/XM/CD/MP3 Audio System with Steering Wheel Controls	INCLUDED
* iPod®/USB/Aux Input Jacks	INCLUDED
* Power Windows/Locks/Mirrors	INCLUDED
* Cruise Control	INCLUDED

Manufacturer's Suggested Retail Price: $24,600.00

America's Best Warranty

- 5-year/60,000-mile New Vehicle Warranty*
- 10-year/100,000-mile Powertrain Warranty*
- 7-year/Unlimited-mile Anti-perforation Warranty*
- 5-year/Unlimited-mile Roadside Assistance

*Limited warranties, see dealer for details

Equipped with XM Satellite Radio

- Free Activation + 3 Months Service; Not Available in AK & HI

OPTIONAL FEATURES:

* This vehicle is certified to meet emission requirements in all 50 states	
* Carpeted Floor Mats	$100.00
* Alloy Wheel Locks	$50.00

Inland Freight & Handling $695.00

Manufacturer's Suggested Retail Price: $25,445.00

VIN: KMHFC46D49A349877
MODEL: 72402
ENGINE #: G6DB8A141279
PORT OF ENTRY: PT
COLOR: Silk Beige Metallic
MODE OF TRANSPORT: Truck

SOLD TO: OH044
GANLEY WESTSIDE HYUNDAI
25600 LORAIN ROAD
NORTH OLMSTED,OH 44070

SHIPPED TO: OH044

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline license and title fees, state and local taxes and dealer installed options and accessories are not included in the manufacturer's suggested retail price.

This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1231 et seq. which prohibits its removal or alteration prior to delivery to the ultimate purchaser.

127 A 1169GSKAUB 232

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APPENDIX B

Discussion on Data

DISCUSSION ON DATA

Symbols for Brake Components

4	-	4 Wheel	G	-	Groan	DL	-	Deceleration (State FPSPS)
X	-	Skid	SQ	-	Squeal	PF	-	Pedal on Floor
L	-	Left	SQK	-	Squeak	SCP	-	Shoe Scrape
R	-	Right	PO	-	Pinchout	RB	-	Rubber Banding
R	-	Rear	P	-	Pull	O	-	Odor
F	-	Front	R	-	Shudder	NOX	-	No Skid
B	-	Both	M	-	Momentary			

INT or INIT	-	Initial Part of Stop
MID	-	Middle of Stop
END	-	End of Stop

All stops were made manually.

APPENDIX C

Contractor's Comments
Procedure Modifications
and
Test Facility

Comments for vehicle C90507.

For all recorded decelerations:

The recorded *average* deceleration values for the tests are slightly lower than that which is required or targeted for certain test sections. However, in all cases and in reality, the driver maintained the correct required/target deceleration values for the majority of time for each of those stops. The recorded deceleration is acquired from the moment the service brake pedal is moved until the vehicle reaches zero speed. Therefore, the time needed to achieve the target deceleration (rise time) and the time the vehicle goes from the target deceleration to zero (fall time) is included in the average deceleration calculation. The rise and fall times were added to the entire length of the stops. Hence, the recorded average deceleration values were generally and slightly less than the required/target deceleration values.

For Data Sheet 13 Stops with Engine Off @ GVWR, the ABS cycled during stops #1 and #4, only.

For Data Sheet 14, Cold Effectiveness @ LLVW, the "Check Engine" lamp came on during the first stop. The driver noted the transmission would only function in second and third gears. The transmission would operate only in second and third gears after each stop. So that the transmission would function normally at the beginning of each stop, the driver would turn off the engine and restart after each stop. Though this restored the transmission to normal operation for the initiation of each stop, the "Check Engine" lamp remained on.

For Data Sheet 15, High Speed Effectiveness @ LLVW, the driver encountered the same condition/warning lamp display as Data Sheet 14 and the driver performed the same countermeasures. However, after completing all the stops required for Data Sheet 14, the driver returned to the service bay and disconnected the negative battery cable for 15 seconds. When the battery cable was reconnected and the engine started, the "Check Engine" lamp was extinguished.

For Data Sheet 16, Anitlock Functional Failure @ LLVW the driver encountered the same condition/warning lamp display and performed the same countermeasures as performed for Data Sheet 15. Also for Data Sheet 16, the "ESC" warning lamp and the "ABS" lamp were lit.

For Data Sheet 17, Variable Brake Proportioning Function Failure @ LLVW, per the manufacturer's response, fuse #24 was removed to induce failure. Both the "ABS" and "BRAKE" lamps were lit. Additionally, the driver encountered the same condition/warning lamp display and performed the same countermeasures as performed for Data Sheet 15.

The Hydraulic Circuit Failure Tests were not performed to the lab procedure sequence to both save time and cause minimal disruption to the hydraulic brake system. Sequence: Circuit #1 @ LLVW; Circuit #2 @ LLVW: Circuit #2 @ GVWR and Circuit #1 @ GVVWR.

For Data Sheet 22, Anitlock Functional Failure @ GVWR the driver encountered the same condition/warning lamp display and performed the same countermeasures as performed for Data Sheet 15. Also for Data Sheet 22, the "ESC" warning lamp and the "ABS" lamp were lit.

For Data Sheet 23, Variable Brake Proportioning Function Failure @ GVWR, per the manufacturer's response, fuse #24 was removed to induce failure. Both the "ABS" and "BRAKE" lamps were lit. Additionally, the driver encountered the same condition/warning lamp display and performed the same countermeasures as performed for Data Sheet 15.

For Data Sheet 27 Hot Performance @ GVWR, stop number one, the driver did not aggressively apply the service brake control. An average control force of 349.8N was permitted, however an average control force of 110.1N was obtained. This resulted in a total stopping distance that exceeded the standard's calculated allowable maximum distance. It is believed that had the driver applied a continuous higher service brake pedal force, a force close to the permitted level, the vehicle would have stopped in less distance and complied with the standard. Also, the driver noted "light smoke" emanating from the front brakes after completing stop number two.

For Data Sheet 29 Recovery Performance @ GVWR, the "Check Engine" lamp lit at the end of stop number one. Upon acceleration for stop number two, the driver noted the transmission started and remained in third gear all the way to the point at which the vehicle reached the appropriate speed, and the driver shifted into neutral for the stop.

The laboratory was unable to disassemble the master cylinder for internal measurement purposes without damage. Therefore, no measurements were taken. For identification purposes, the external markings were: 1 BM1111084 F 8 (within circle) MANDO – on the side. On the front – DC 1G 11 69 NFL E.

7.5-MILE TEST TRACK

The 7.5-mile test track encloses a 1,600-acre area, one mile wide and 3.5 miles long.

The track has a downward grade, north to south, of 0.228 percent and a cross slope in the straightaways of 3/16 inch per foot. The 1.88 mile long straightaways flow into transition areas 2,300 feet in length and then into 5,275-foot long curves with a constant radius of 2,400 feet. The 36-foot wide straightaways and the 42-foot wide curves provide three test lanes. Paved berms, 12 feet in width, border the straightaways and the inside of the curves.

As a vehicle moves toward the outside of the track in the curves, it encounters a progressively steeper bank. The inside lane (or "slow" lane) has a bank of 10 degrees allowing a neutral speed of 80 mph with no side forces. In the center lane, the slope increases to 19 degrees resulting in a neutral speed of 110 mph. The outside lane's 28-degree bank allows a 140 mph neutral speed. Rimming the outer lane is a seven-foot safety lane culminating in a 36-degree slope at the guardrail.

The facility is paved with Portland cement concrete. It carries a maximum single axle load of 36,000 pounds and a maximum tandem axle load weight of 48,000 pounds. Special provisions can be made for heavier weight loads.

With 22.5 lane miles, our track will accommodate many vehicles simultaneously. Research which utilizes the track includes component performance and durability studies, brake tests, aerodynamic studies, fuel economy studies, drive line efficiency tests, and the determination of vehicular acceleration and cruise characteristics. In addition, it supports maximum speed determination, road load power, noise and emission measurements and tire durability test programs.

The 7.5-mile test track can be used in conjunction with other facilities at TRC. It provides an excellent area for pre-test conditioning of equipment such as brake burnishing, tire break-in, and vehicle warm-up.

TRC SKID PAD

The Skid Pad is a test facility which is utilized primarily for the evaluation of tire and brake systems.

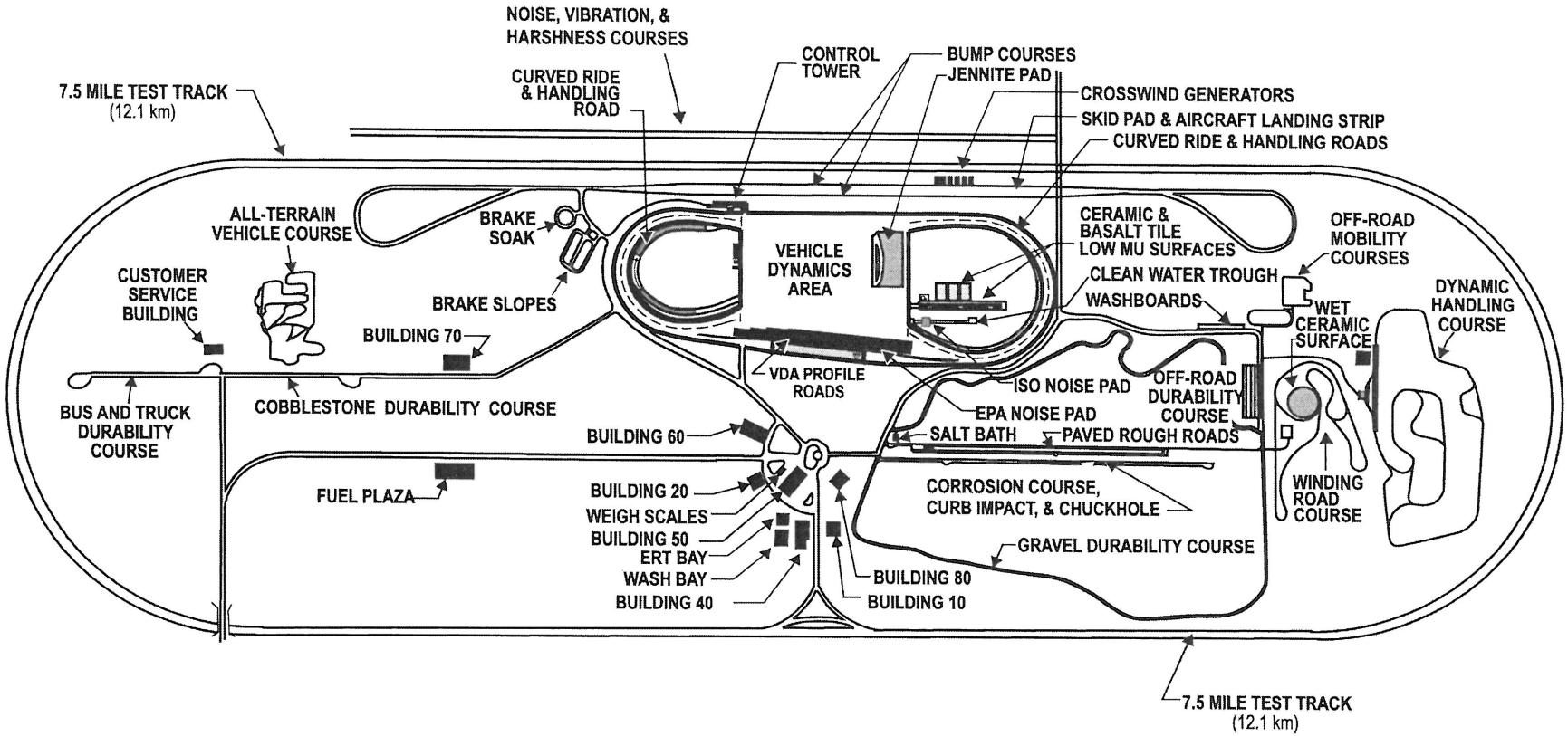
The overall dimensions of the pad are 9,000 feet by 84 feet with loops on the north and south ends. Both turnaround loops have a 309-foot radius and are 16 feet wide with a 25 percent super elevation. They will accommodate speeds of 45 mph with zero side force and 60 mph with .5 g's lateral acceleration. The acceleration/deceleration lanes at each end are 3,280 feet in length.

A test area of 210,000 square feet is situated in the center of the skid pad containing several test pads with varying surface textures. Skid numbers in this area range from 30 (wet) to 80 (dry).

The skid pad is paved with Portland cement. The load capacity of the skid pad is 36,000 pounds maximum single axle weight and 48,000 pounds maximum tandem axle weight.

Varying surface textures in the main test area are ideal for testing tire and/or brake system performance on different surfaces as characterized by "skid numbers." The skid pad is also used for acceleration studies, aerodynamics, rolling resistance, noise testing, and vehicle top speed determination.

The subject test vehicle was rear wheel anti lock equipped. Rather than rapidly and fully applying the service brake control, the driver modulated the service brake control as necessary to control/prevent front wheel lock.

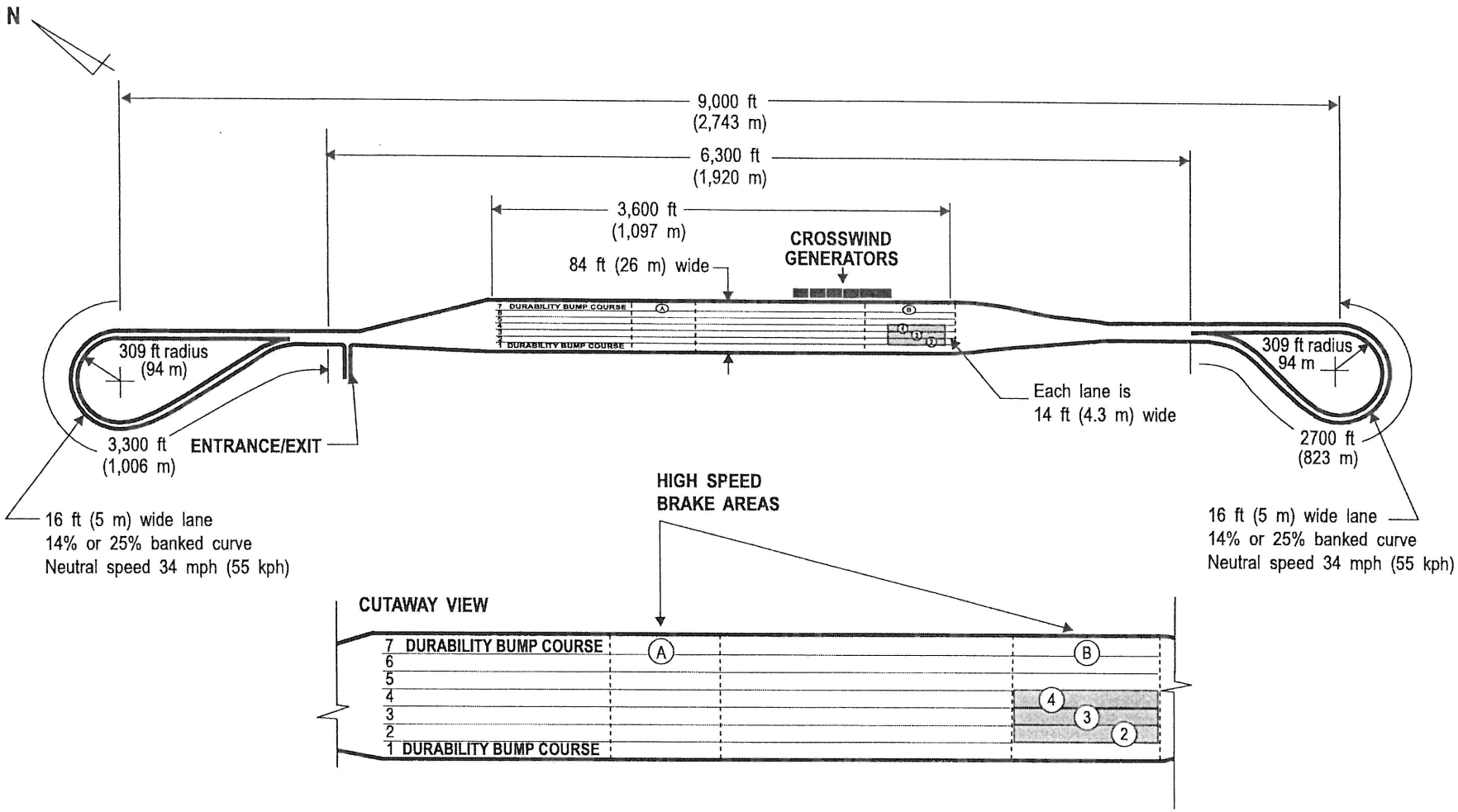


Not to Scale

TEST FACILITY DETAIL

TRANSPORTATION RESEARCH CENTER INC.
EAST LIBERTY, OHIO 43319-0367
www.trcpg.com

F-15 0308



Not to Scale

GVW for Lane 1 and 7 (Asphalt Lanes) = 8,000 lbs (3,636 kgs)

GVW for All Other Lanes (Concrete Lanes) = 80,000 lbs (36,364 kgs)

All Concrete Broomed Surface

1 Lap (Including Loops) = Approximately 4 mi (6.4 klm)

SKID PAD

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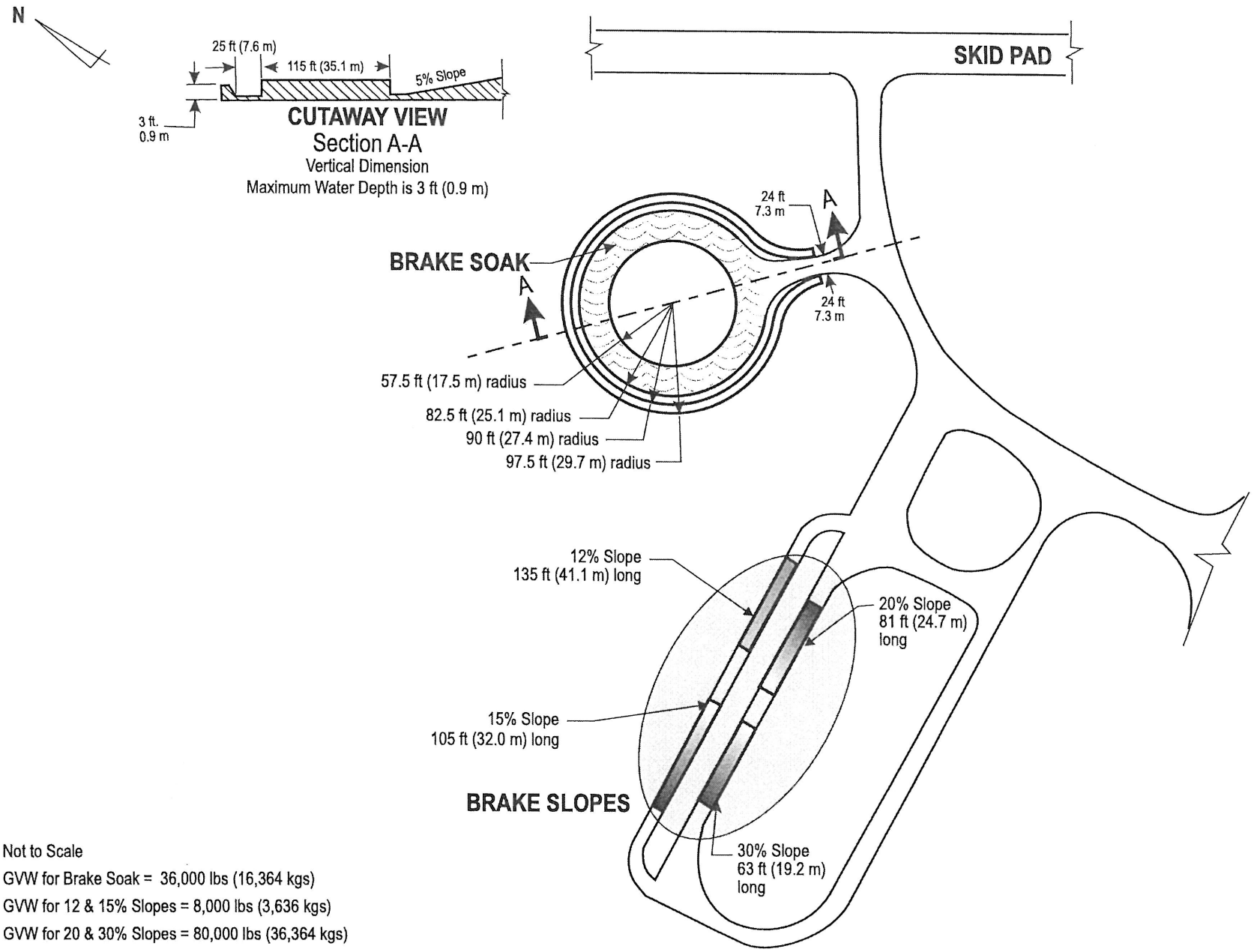
www.trcpg.com

F-13 0308



Not to Scale

GVW for Brake Soak = 36,000 lbs (16,364 kgs)

GVW for 12 & 15% Slopes = 8,000 lbs (3,636 kgs)

GVW for 20 & 30% Slopes = 80,000 lbs (36,364 kgs)

BRAKE SOAK & BRAKE SLOPES

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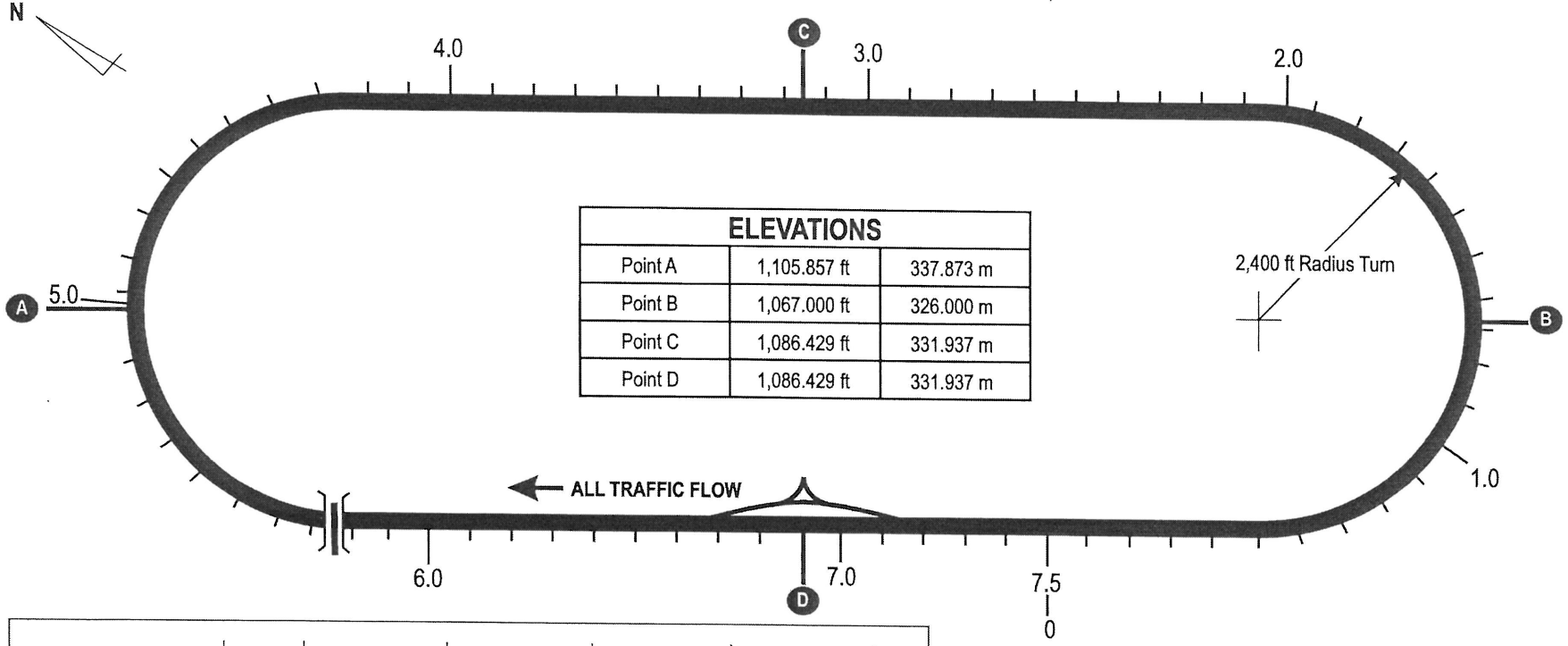
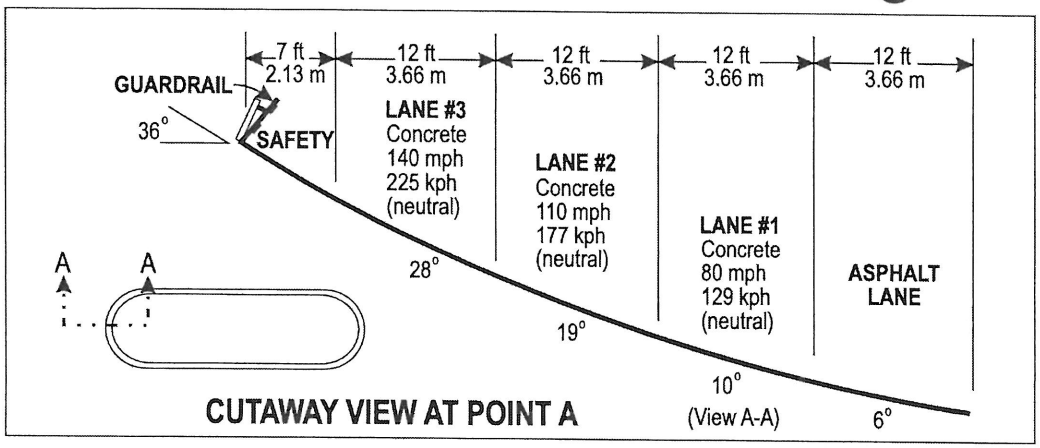


ELEVATIONS		
Point A	1,105.857 ft	337.873 m
Point B	1,067.000 ft	326.000 m
Point C	1,086.429 ft	331.937 m
Point D	1,086.429 ft	331.937 m



DISTANCES		
Lane 3	7.539 mi	12.133 km
Lane 2	7.521 mi	12.104 km
Lane 1	7.507 mi	12.081 km
Point A to Point B	3.333 mi	5.364 km
Point C to Point D	.947 mi	1.524 km

Not to Scale

GVW = 80,000 lbs (36,364 kgs)

7.5-MILE TEST TRACK

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APPENDIX D

Notice of Possible Non-Compliance

This vehicle (C90507) met the requirements of the FMVSS 135 Standard.